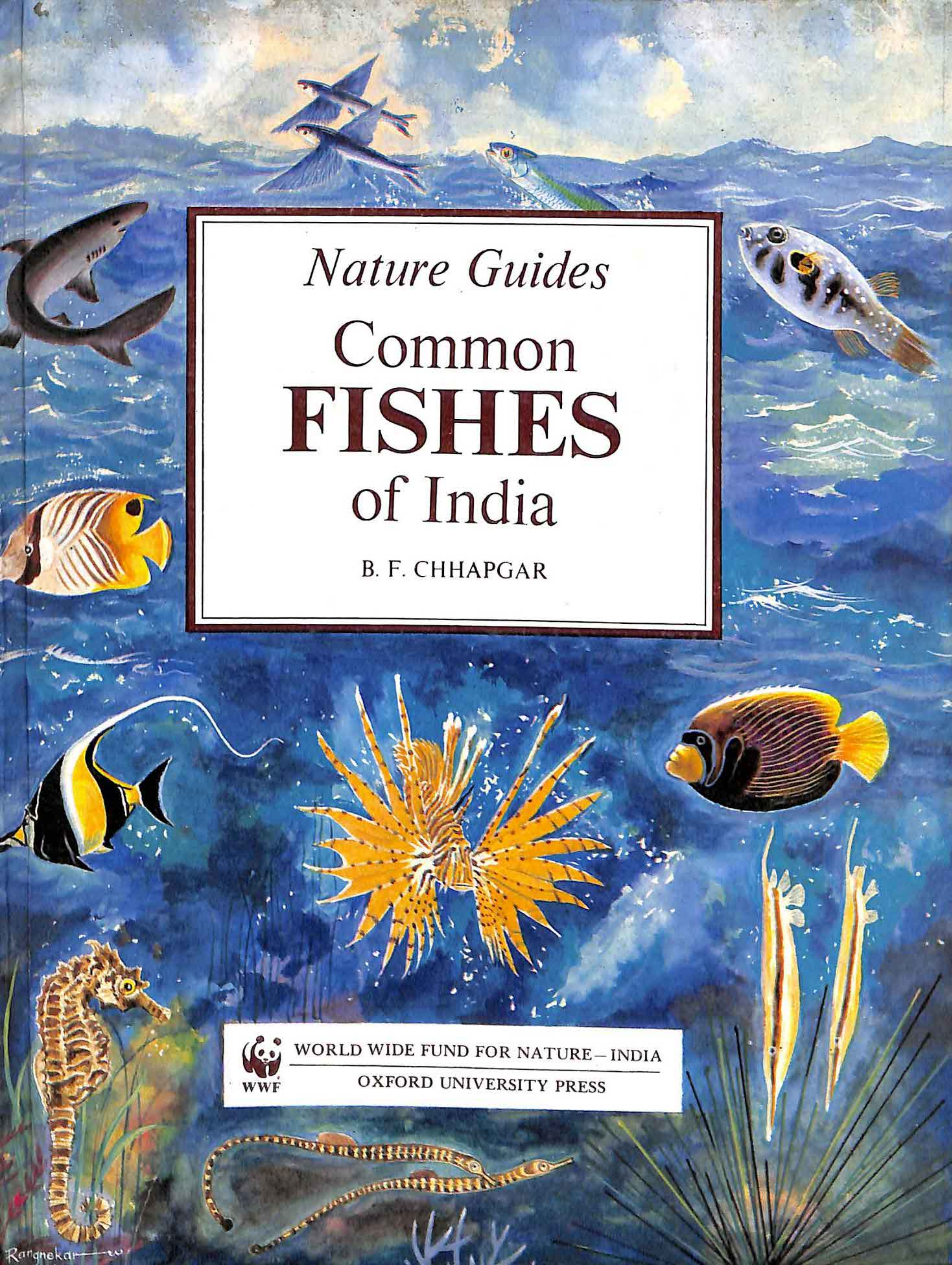

Nature Guides

Common FISHES of India

B. F. CHHAPGAR

WORLD WIDE FUND FOR NATURE – INDIA
OXFORD UNIVERSITY PRESS

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FOREWORD

More than seventy per cent of our earth is covered with seas and oceans. It is a watery planet! A vast variety of fishes, from mantas to minnows, inhabit the seas. They naturally play a crucial role in man's existence on land, both as food and as targets for exploitation by man for his industrial advance and for his leisure activities. It is in our interest, therefore, to make special efforts to observe them in their natural habitat. While many wildlife lovers watch birds or 'shoot' jungle animals with a camera, few bother to observe fishes at first hand.

This is reflected in the paucity of books on Indian fishes. The few books we have are mostly serious tomes written in scientific jargon and are understood only by academics. To my mind, one of the best is that by Sir Francis Day, written as early as 1878, but still an excellent book for a detailed knowledge of Indian fishes. It was out of print for a long time and, though a reprint is now available, it is very expensive and is intended for the specialist rather than the lay reader.

The need for a book on Indian fishes, written for the lay person, has therefore been a long felt need. The sponsorship of this book by the World Wide Fund for Nature—India fills a lacuna. Dr Chhapgar, the author, is that rare combination of a lover of the outdoors, an enquirer, curious to observe and learn, and a gifted writer. He has roamed the seas for four decades, gathering first-hand knowledge of aquatic life. He has written three books, and over a hundred popular articles in several well known foreign and Indian journals and magazines. He has been a contributing editor to *The Aquarium* and *Freshwater and Marine Aquarium* for many years, the only Indian to have had the honour. His portrait hangs in the gallery of the Smithsonian Institution for his outstanding work in this field. He is also a Life Fellow of the International Oceanographic Foundation. Dr Chhapgar was associated with the Taraporevala Aquarium, Bombay for 22 years, and was its Curator from 1959 to 1965. With his vast knowledge and experience of fishes Dr Chhapgar is, I am absolutely certain, the right person to write this book. It is written in simple English and with clarity for the budding wildlife enthusiast. This book is the second in the series of Nature Guides being sponsored by the World Wide Fund for Nature—India. I hope that it serves to kindle curiosity in the young and lead them on to both first hand study of fishes and more advanced research on the subject.

Vice Admiral M.P. AWATI
P.V.S.M., Vr C (Rtd.)
Chairman
World Wide Fund for Nature—India
Maharashtra State & Goa Committee

PREFACE

Water is the essence of earth (*Chhandogya Upanishad*).

Man, a terrestrial creature, has named our planet 'Earth'. Considering that more than seventy per cent of its surface is covered by water, it would be more appropriate to call our planet 'Waters'. These waters—be they the salty oceans, flowing rivers or stagnant lakes—are inhabited by a unique variety of animals remarkably adapted to leading an aquatic life. In the 450 million years since fishes evolved, they have spread out even into apparently uninhabitable places, such as the sea bottom where their bodies are subjected to a pressure of thousands of kilograms per square centimetre. There are fish which are comfortable in the ice-cold waters of the Himalaya and can live in the torrential currents of these mountain-streams; blind fish whose lack of vision is no handicap in unlighted underground caves.

In the process of evolution, they have been so successful in colonizing this planet that there are more types of fish than all the other backboned animals put together. There are fish that live inside the body cavities of other animals. Fish that drown if they are submerged in water and are not allowed to come up to the surface to breathe air. Fish that can produce electricity. Fish that are cannibals even before they are born. Fish that travel overland to seek better places to live in. Fish where it is the male that gives birth to the young. Fish that shoot bullets of water to kill their prey. And fish that serve as doctors and dentists tending to their fish patients.

Formerly, fish were considered to be one of the five Classes of backboned animals. The others are amphibians (frogs and toads, newts and salamanders), reptiles (snakes, lizards, crocodiles and tortoises), birds and mammals (furred animals that suckle their young). In scientific jargon, fish were known as *Pisces,* from the Latin word for them. Today we know enough about them to consider them as a huge and complex group comprising several distinct Classes.

Fishes come in all sizes, ranging from the tiniest which is 10 mm in length and weighs 1.5 grams, to a gigantic 20 metres weighing 4000 kg.

Unfortunately, for many of us whose experience is limited to the sight of drab, uniformly spindle-shaped fish generally seen lying with fixed, staring eyes in a fisherwoman's basket, we have no idea of how prettily coloured and shaped fishes can be. Nor do many of us know the enchanting habits many of them have. This slim book is an attempt to introduce these lively, beautiful inhabitants of our waters to them. The scope of description is limited by the size of this book. Of the hundreds of varieties in Indian rivers and lakes, and the seas surrounding our country, we have had to restrict ourselves to only 137. Limited indeed! Its purpose will, however, have been served, and the author well rewarded, if it kindles the curiosity and interest of readers, and acts as a bait (!) that draws them to more comprehensive and specialized books on the subject.

B. F. Chhapgar

INTRODUCTION

What is a fish?

Silly though the question may seem, one comes across names of animals such as jellyfish, starfish, crayfish, cuttlefish and silverfish. One need not undertake a study of fishes (Ichthyology) to realize that none of these animals is really a fish in the scientific sense. The poet Leigh Hunt described fish as 'scaly, slippery, wet, swift, staring wights'. Although this description comes close to defining fish, it is not completely accurate. Some fish, like eels for example, do not have scales. On the other hand, some animals, such as sea snakes, are scaly and somewhat slippery.

A fish may be described as an animal which lives in water, has a backbone, breathes by means of gills, and has paired fins to enable it to move. While some animals may have one of these characters, only a fish has all of them. Thus, a silverfish does not breathe through gills or live in water—it is an insect found making holes in books. Jellyfish, starfish, crayfish and cuttlefish do not have a backbone and, therefore, are not fish. A sea snake lives in water and has a backbone, but it breathes through lungs. So also do dolphins, porpoises and whales, the shape of whose bodies is like that of fish, but which are actually mammals that suckle their young.

It may be useful to know some common terms used in describing the parts of a fish's body. A typical fish has seven sets of fins on its body. Of these, four are paired, i.e. one on each side of the body, while the remaining three are median, being situated vertically on the midline of the body. The tail is also known as the caudal fin, and its fleshy, muscular part (where the tail joins the body) is the caudal peduncle. The tail fin is the most important of all the median fins, being used by the fish for moving forward when swimming.

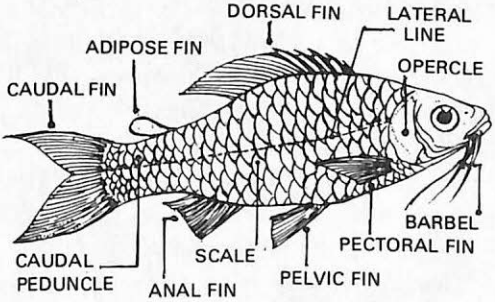


Fig. 1: Parts of a Fish

The fin on the back is known as the dorsal fin. There may be one dorsal fin (as in the carp) where the fin consists of a thin membrane supported by branched finrays. Or the single dorsal fin may consist of an anterior (forward) part supported by sharp, unbranched fin spines, and a posterior (hind) region of branching finrays (e.g. in perches). The two parts of such a fin are called the spiny dorsal and soft dorsal. In some fishes these two portions of the dorsal fin may be separated by a gap, so that there seem to be two dorsal fins. In some catfishes there are two dorsal fins. The first dorsal has the usual branched finrays. But the second—called an adipose fin—has no supporting rays, being made up of a fatty tissue. The remaining median fin is the anal fin, near which the anus (vent) is situated.

Of the two pairs, one consists of the pectoral fins, behind the gill-cover (opercle) which lies just behind the head. These are equivalent to our arms. The second pair are the pelvic fins—also called ventral fins. These may be situated behind, or sometimes under, the pectoral fins, and are the equivalent of our legs. The paired fins are used by the fish for steering.

In some fishes there are several pairs of feelers around the mouth, sensitive to the touch. These are known as barbels.

THE PROBLEM OF NAMES

Those unfamiliar with biology are puzzled by the scientific names of plants or animals which, to them, are incomprehensible. So why have scientific names at all? There are many reasons for this, the main one being to avoid confusion. Many animals may have the same common or popular name. Thus the Indian salmon with the scientific name of *Eleutheronema tetradactylum* is a different fish from the Atlantic salmon of America (whose scientific name is *Salmo salar).* Equally, a fish may be called by different names in different countries. *Poecilia reticulata,* a very popular fish known as guppy to those who keep live pet fish at home, is also known as peacock fish, rainbow fish, millions fish, bellied fish and mosquito fish. Imagine the confusion all these names might cause to someone not familiar with the fish. He would imagine that we are talking about six different kinds of fish. Add to that the problem of language. The Indian salmon in Maharashtra is called 'rawas', in Karnataka 'ramsi', in Tamilnadu 'polun kala', and in Andhra Pradesh 'maga jellee'.

The use of a single scientific name avoids all this confusion. The system was established by Linnaeus, a Swedish botanist, in the eighteenth century, and is now universally adopted. It is called binomial, because each animal or plant has a double name—the generic (written first) always starting with a capital letter, followed by the trivial (or specific) name, starting with a small letter. Genus and species are loosely equivalent to our surname and personal name.

These names are in Latin or Latinized versions of other languages. In biological classification, we have two main kingdoms—animal and plant (leaving aside the primitive microscopic forms such as bacteria and viruses). Each kingdom is divided into several phyla (singular phylum), which are further subdivided into classes, orders and families. Interspersed may be subphylum, subclass, suborder and subfamily. Thus, for the Indian salmon, we have the following classification:

- Phylum CHORDATA
  - Subphylum VERTEBRATA
    - Class TELEOSTOMI
      - Subclass TELEOSTEI
        - Order POLYNEMIFORMES
          - Family POLYNEMIDAE
            - Genus *Eleutheronema*
              - Species *tetradactylum*

So, in spite of Shakespeare's comment 'What is in a name?', in science we follow this systematic, though apparently complicated, method. It may be noted that the name *Eleutheronema tetradactylum* is given to one, and only one, kind of fish. No other animal, let alone fish, will have that particular name. At the same time, this fish will have this one name only, and no other name so that any person, speaking any language, when he comes across this name will know which animal is being referred to.

For the purpose of breaking up the contents of this book into separate sections, the fishes have been described under their Orders. But to give meaning to the Orders, for the ordinary user, we have first given popular names of a few representative examples of fishes in that Order. The Class and Order have been given below that.

CLASSES, ORDERS AND SPECIES

SHARKS, SKATES AND RAYS

Class ELASMOBRANCHII

Order SELACHII

Sharks are quite well known as being hazardous to man. This characteristic has been so sensationalized that one tends to think of sharks as merciless, rapacious man-eaters with nothing good to be said of them. It is not realized that many more sharks are killed every year by men than are men by sharks. Sharks (and their relatives—the rays, guitarfish and sawfish) do not have a bony skeleton. Instead, they have cartilage (gristle). They are predominantly marine fish (i.e. salt-water fish) with very few fresh-water representatives. The skin is covered with tiny, tooth-like scales which are bent backward. So, if one strokes a shark from head to tail, the skin feels quite smooth. But stroke it from tail to head and it feels like sandpaper. In fact, in earlier times the dried skin, known as shagreen was used as sandpaper.

It is not sharkskin alone that is useful to man. The dried fins can be made into delicious soup, while the liver yields oil which is richer in Vitamin A than cod-liver oil. The flesh can be eaten, although it smells of urea and has to be well soaked in water before cooking.

The teeth of sharks are no more than modified scales, similar in shape to those on the skin but much larger. They are found in several rows in the jaws. If one is broken or lost, another from the next row moves forward to replace it.

While the White Shark (*Carcharodon carcharias*) (Fig. 2), which is a man-eater, grows to 13 metres in length, most sharks—and their very small cousins, the dogfish—are about a metre in length, or even less. Fortunately, whale shark, the largest shark in the world which grows up to 15 metres in length, is harmless to man as it has small teeth. It swims forward with its mouth wide open and minute drifting animals are filtered out in the mouth to be gulped down as food.

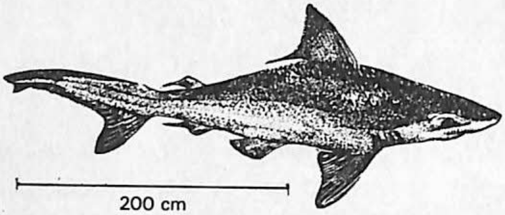


Fig. 2: White Shark (*Carcharodon carcharias*)

Some sharks and dogfish lay eggs known as 'mermaid's purse'. The corners of the egg-cases bear slender tendrils which get entangled amongst seaweed and thus anchor the egg-cases. Other sharks are viviparous, which means they give birth to live young—sometimes as many as forty. In some sharks the young are cannibals even before they are born! A large number of eggs are found in the womb, but only two babies are born. The first baby to hatch in each compartment in the womb (oviduct) feeds on its brothers and sisters which are still in the womb.

The sharks that live on the floor of the sea have fleshy feelers (barbels) near the nostrils and are often prettily spotted or striped. For example, the zebra or tiger shark (*Stegostoma tigrinum*) (Fig. 3).

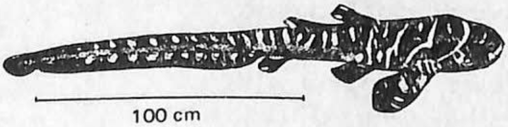


Fig. 3: Zebra Shark
(*Stegostoma fasciatum*)

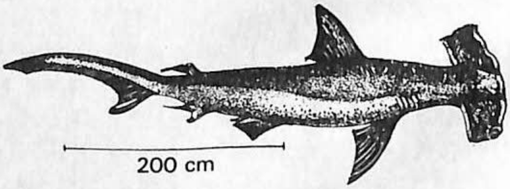


Fig. 4: Hammer-headed Shark
(*Sphyrna zygaena*)

In hammerheaded sharks (*Sphyrna*) (Fig. 4) the head is broadened and set at right angles to the body, so that it forms the shape of the letter 'T'. The eyes and nostrils are set at the two ends of the head. People have occasionally been attacked by them.

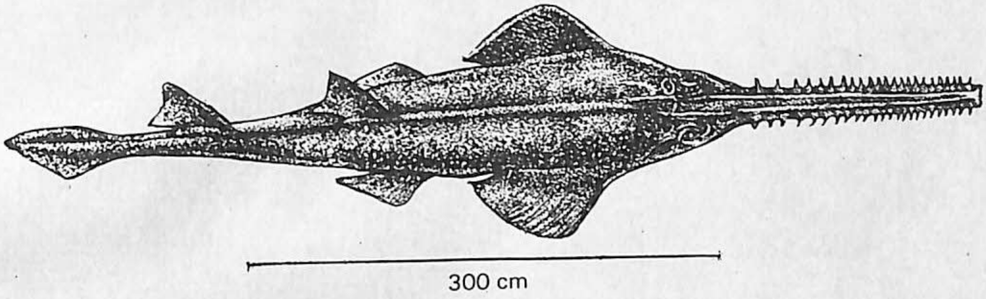


Fig. 5: Sawfish (*Pristis cuspidatus*)

Sawfish (Fig. 5) have a long snout in front of the head, lined on each side by a row of teeth. These resemble a carpenter's saw.

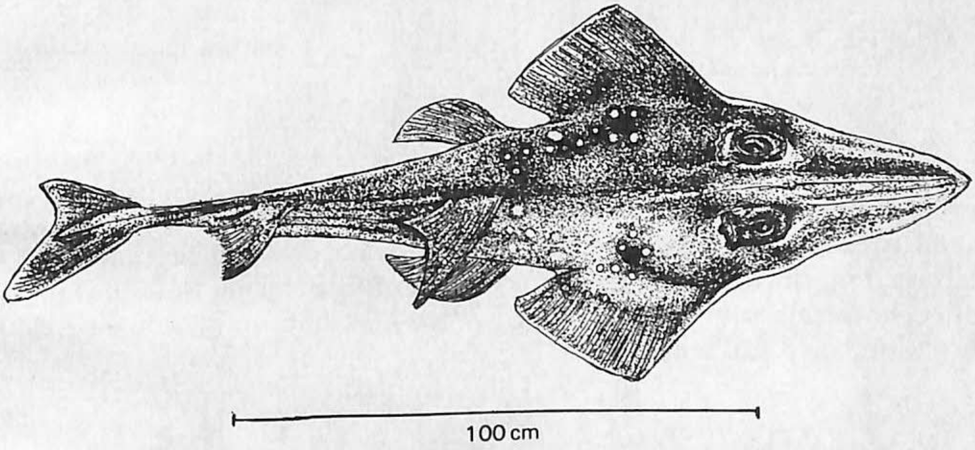


Fig. 6: Shovel-nosed Ray (*Rhynchobatus djiddensis*)

Intermediate between the sharks and rays are the guitarfish or shovel-nosed rays (*Rhinobatis*), marine fish (Fig. 6). The rear part of the bodies of these resembles those of sharks, but the pectoral fins are partly fused with the head to form a flattened 'shovel', with the eyes on top and the mouth and gill-slits below.

RAYS

Order BATOIDES

In the sting rays (*Dasyatis*) (Fig. 7), marine fish, the body is kite-shaped and ends in a long, whiplike tail. At the base of the tail are one or more saw-toothed spines with venom glands. The ray rests on the sea bottom with its body, except its eyes, completely buried. If accidentally trodden upon or otherwise harassed, the tail is lashed from side to side and its spines can inflict a nasty cut into which venom is introduced. This causes a painful, festering wound which often requires hospitalization. Butterfly rays (*Pteroplatea*) (Fig. 8), marine fish, have a very wide body and a short tail.

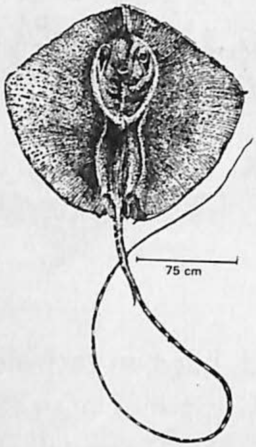


Fig. 7: Sting Ray
(*Dasyatis uarnak*)

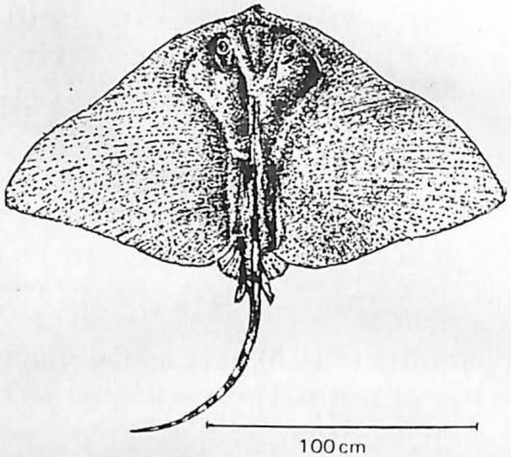


Fig. 8: Butterfly Ray
(*Pteroplatea micrura*)

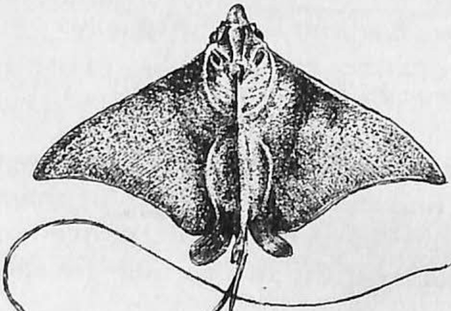


Fig. 9: Eagle Ray
(*Aetobatis narinari*)

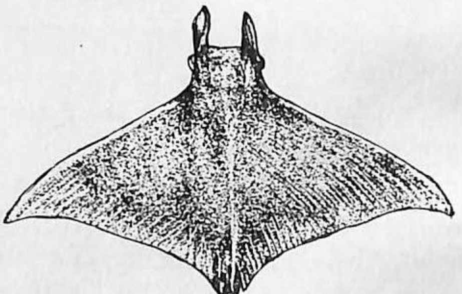


Fig. 10: Devil Ray
(*Mobula diabolus*)

While the sting rays swim with a wave-like motion of their fins, the eagle rays (*Aetobatis*) (Fig. 9), marine fish, swim gracefully with a flapping wing-like movement of their fins. The pectoral (on the chest) fins stop short at the mouth, giving the fish its alternate name of 'cow-nosed ray'. Like the sting rays, their body is suitably coloured for camouflage, being muddy brown on the back and white on the belly.

The largest of the rays, viz. the devil ray or manta (*Mobula*) (Fig. 10), a marine fish, has a 'wing-span' of seven metres and weighs around a ton. There are two flexible, horn-like projections at the front of the head.

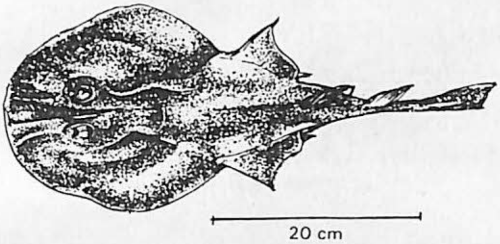


Fig. 11: Electric Ray (*Narcine timlei*)

The electric ray (*Torpedo, Narcine*) (Fig. 11), has an organ made up of modified muscles which produces an electric current that can stun its prey or ward off its enemies.

HERRING, SARDINES, SPRATS AND ANCHOVIES

Class TELEOSTOMI
Order CLUPEIFORMES
Suborder CLUPEOIDEI

Among the bony fishes, the most abundant and prolific are the clupeids, comprising the herring (*Harengula*) (Fig. 12), sardines (*Sardinella*) (Fig 12A),

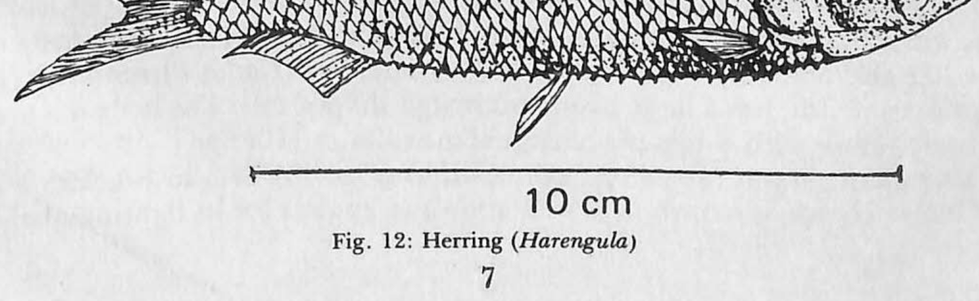


Fig. 12: Herring (*Harengula*)

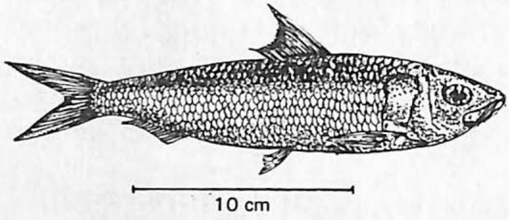


Fig. 12A: Sardine
(*Sardinella longiceps*)

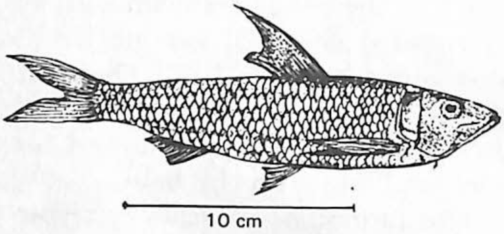


Fig. 13: Sprat
(*Stolephorus malabaricus*)

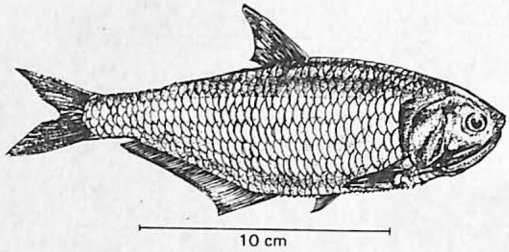


Fig. 14: Anchovy
(*Thryssa malabarica*)

sprats (*Stolephorus, Dussumieria*) (Fig. 13) and anchovies *(Thryssa)* (Fig. 14). Small, pelagic (i.e. swimming near the surface of the sea), schooling (i.e. moving together in large numbers or shoals) marine fishes, these constitute the mainstay of our fisheries. They are thus of great economic importance. They are drab in appearance, with greyish-blue backs merging with the silvery shade of the belly.

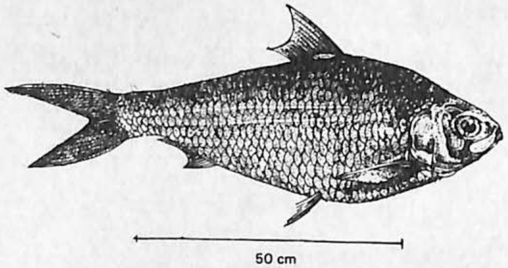


Fig. 15: Indian Shad
(*Hilsa ilisha*)

Of special interest is the Indian shad, popularly known as '*hilsa*' (Fig. 15), because of its anadromous migration (i.e. it lives in the sea but ascends rivers to lay its eggs in fresh water). The pupil of its eye is vertically elongated.

In white bait (*Ilisha*) (Fig. 16), marine fish, the belly has an extremely thin edge like the blade of an axe. The golden anchovy (*Coilia dussumieri*) (Fig. 17), a marine fish, has a large head and wedge-shaped tail. The body is a pretty turmeric yellow with a row of shiny golden scales.

The Indian tarpon *(Megalops cyprinoides)* (Fig. 18) lives in brackish water and is also known as ox-eye. It is well-known to anglers for its fighting qualities

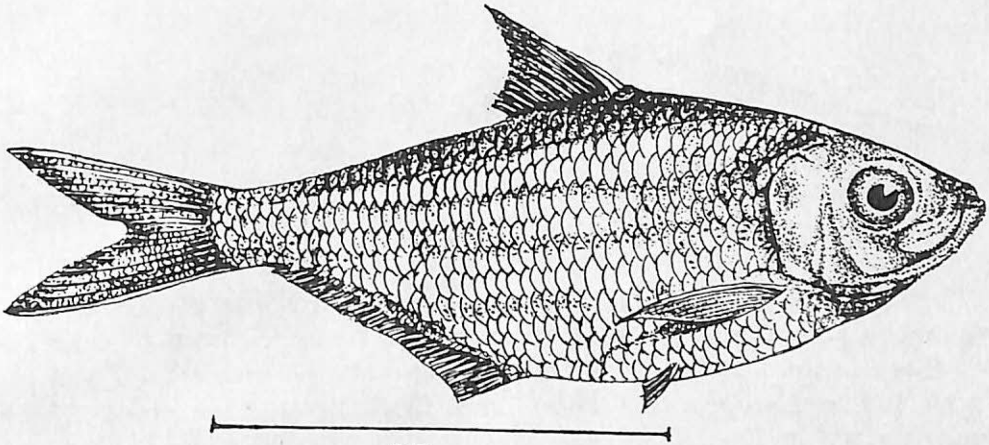


Fig. 16: White Bait (*Ilisha filigera*)

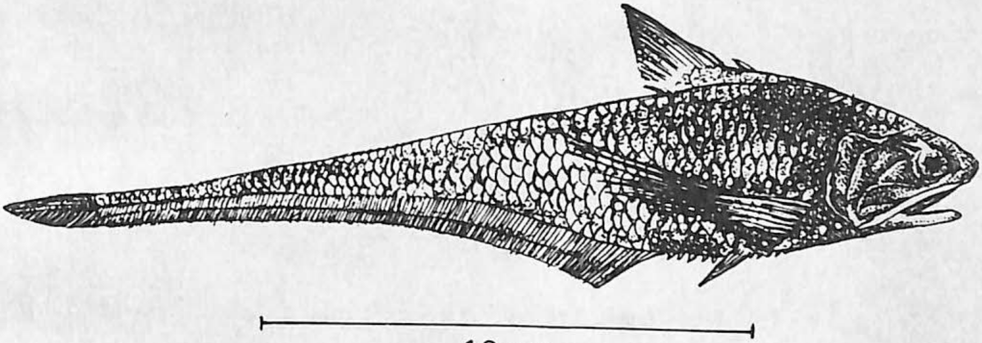


Fig. 17: Golden Anchovy (*Coilia dussumieri*)

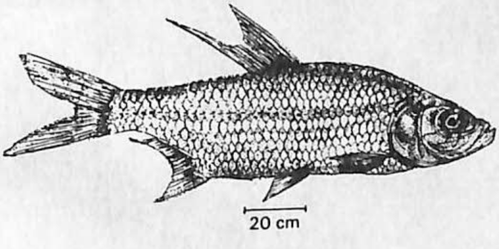


Fig. 18: Indian Tarpon
(*Megalops cyprinoides*)

when hooked. The milkfish (*Chanos chanos*), growing to a metre in length, is commonly reared in captivity as a table fish.

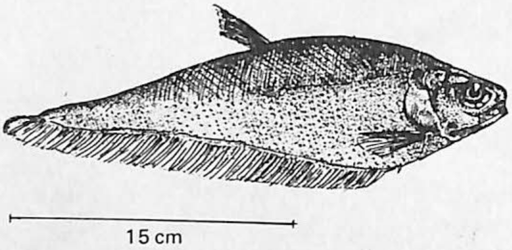


Fig. 19: Razorfish
(*Notopterus notopterus*)

The razor fish (*Notopterus*) (Fig. 19), a freshwater fish, is aptly named after the long, straight anal fin resembling the old-fashioned barber's razor. Of the two species found in India, the larger (more than a metre long) and prettier North Indian *Notopterus chitala* has a small head, broadening into a big hump-backed body.

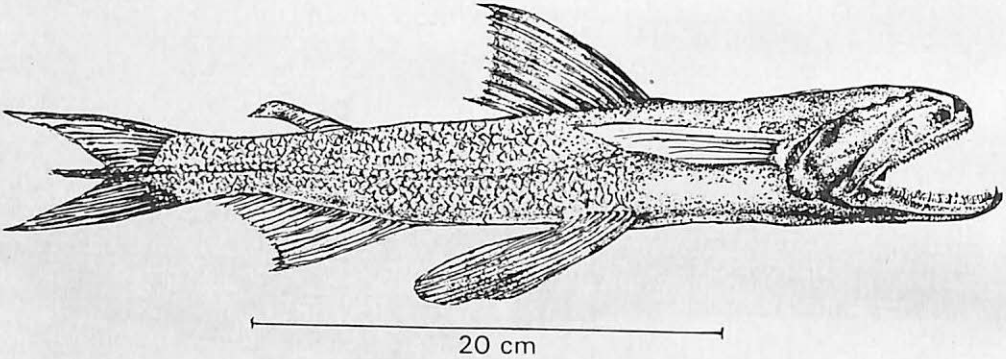


Fig. 20: Bombay Duck (*Harpodon nehereus*)

The well-known Bombay duck (*Harpodon nehereus*) (Fig. 20), a marine fish, has a soft, jelly-like body with tiny eyes situated near the end of the snout and an underslung jaw with sharp, wicked-looking teeth. On the back, well behind the rayed dorsal fin (on or near the back), is a small adipose (fatty) fin as in catfishes.

BARBS, LOACHES, CARPS AND CATFISH
Order Cypriniformes

This Order includes carps and catfishes, both of which are the commonest fish in India.

Carps (family Cyprinidae), freshwater fish, are mainly known for their food value, especially the larger varieties like catla (*Catla catla*), rohu (*Labeo rohita*) (Fig. 21), and mrigal (*Cirrhina mrigala*). Freshwater fish without teeth on the jaws, they have been introduced all over India in tanks and ponds.

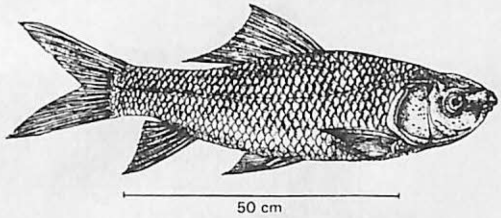


Fig. 21: Rohu
(*Labeo rohita*)

Besides these native carps, others from China, viz. the grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), common carp (*Cyprinus carpio*), and goldfish (*Carassius auratus*) have also been introduced into India for their food or decorative value.

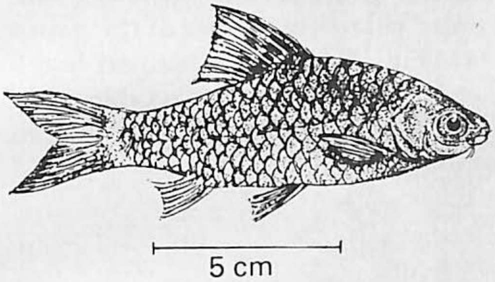


Fig. 22: Barb (*Puntius chola*)

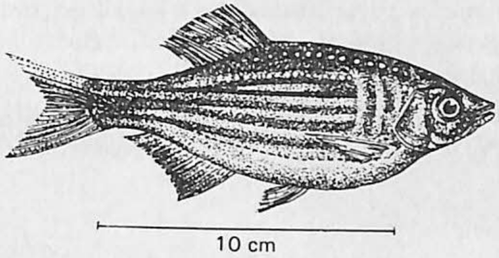


Fig. 23: Danio (*Danio aequipinnatus*)

Barbs (*Puntius*) (Fig. 22) are small to medium-sized freshwater fish with their bodies covered with large, silvery scales and (usually) two or four whisker-like barbels (fleshy, thread-like membranes) around the mouth. Together with their cousins, the danios (*Rasbora, Danio*) (Fig. 23), freshwater fish, they are popular as pets in home aquariums.

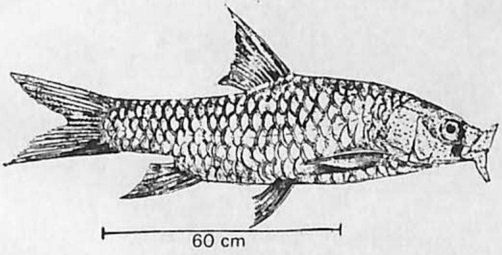


Fig. 24: Mahseer (*Tor putitora*)

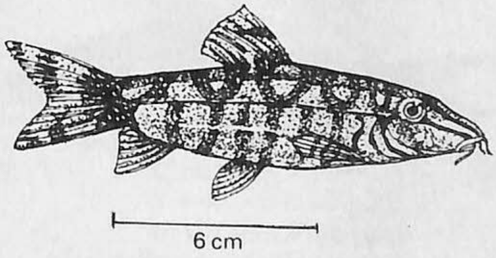


Fig. 25: Y-Loach (*Botia lohachata*)

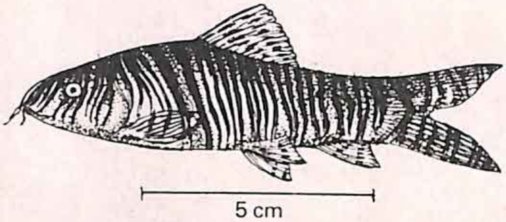


Fig. 26: Striped Loach (*Botia striata*)

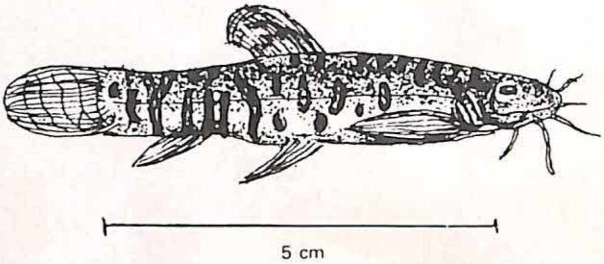


Fig. 27: Scavenger Loach
(*Nemacheilus evezardi*)

Mahseers (*Tor*), freshwater fish, (Fig. 24) are larger and, due to their fighting qualities when hooked, are the anglers' delight.

Loaches (family Cobitidae) are small freshwater fish with mouths that are usually surrounded by 6 to 12 barbels. The more colourful species of the genus *Botia*, such as the Y-loach (*Botia lohachata*) (Fig. 25) and the striped loach (*Botia striata*) (Fig. 26), even though they have a two-pronged retractable spine beneath each eye, are popular home-aquarium pets, while the tubular-bodied *Nemacheilus* are efficient scavengers (Fig. 27).

CATFISH

Suborder SILUROIDEI

Competing in number of species with carp and barb are catfishes, living both in the sea and in fresh water. Typical characteristics of catfish are a naked, scaleless skin, the presence of four pairs (nasal, mental, maxillary and mandibular) of whisker-like barbels surrounding the mouth, and (usually) an adipose fin on the back behind the first spiny dorsal fin. The dorsal (on the back) and pectoral spines (on the chest) of many catfishes have venomous glands, so they should be handled with care.

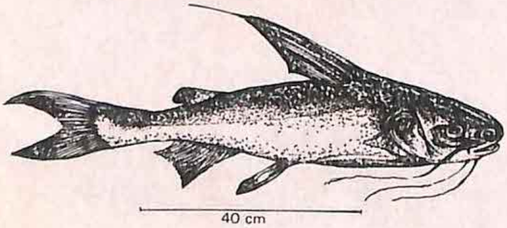


Fig. 28: Marine Catfish
(*Tachysurus jella*)

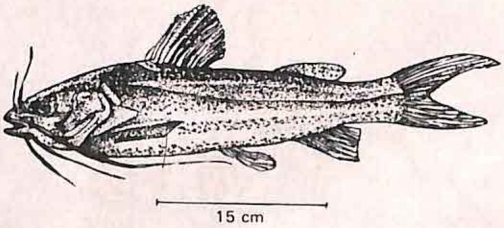
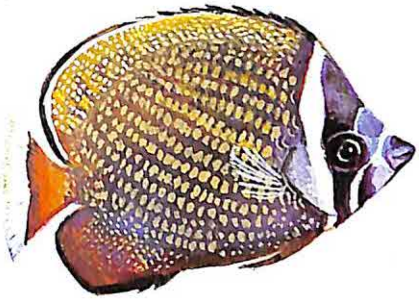


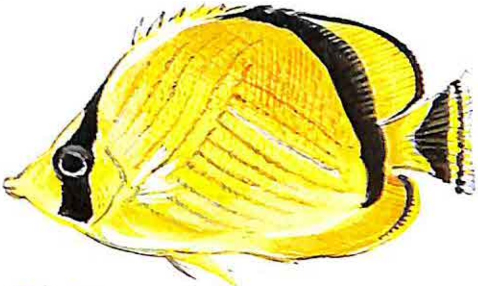
Fig. 29: Freshwater Catfish
(*Mystus seenghala*)

Marine catfishes (*Tachysurus*) (Fig. 28) have a large first dorsal fin, with a powerful saw-toothed spine in front, small anal and pelvic fins, and a forked

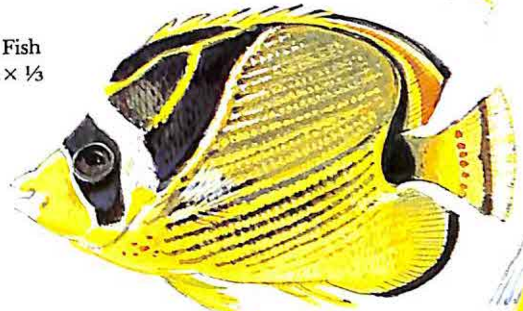
White-collared Butterfly Fish
(Chaetodon collare) × 2/5

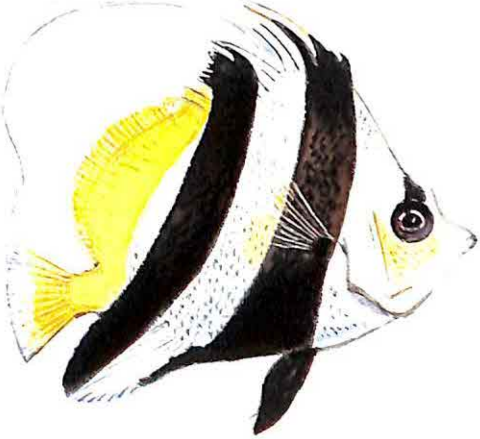


Vagabond Butterfly Fish
(Linophora vagabunda) × ⅓

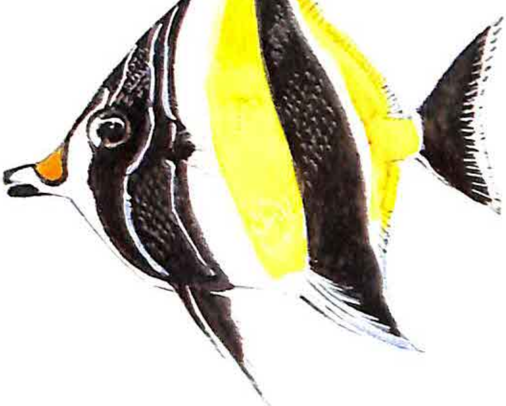


Skunk Butterfly Fish
(Chaetodon lunula) × ⅓



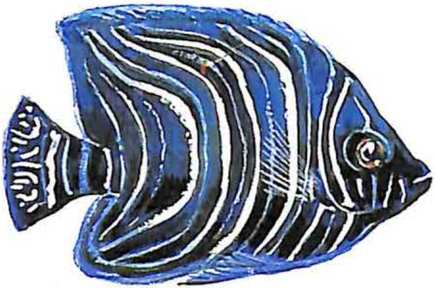


Pennant Fish
(Heniochus acuminatus) × ¼

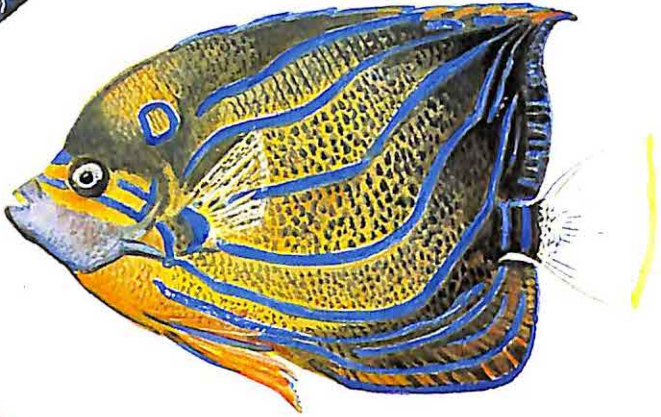


Moorish Idol
(Zanclus cornutus) × ¼

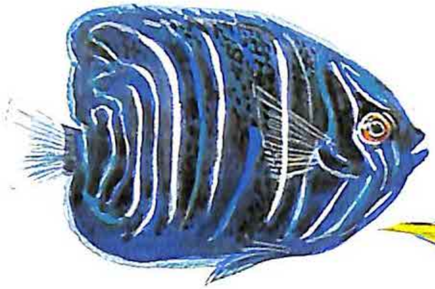
PLATE I



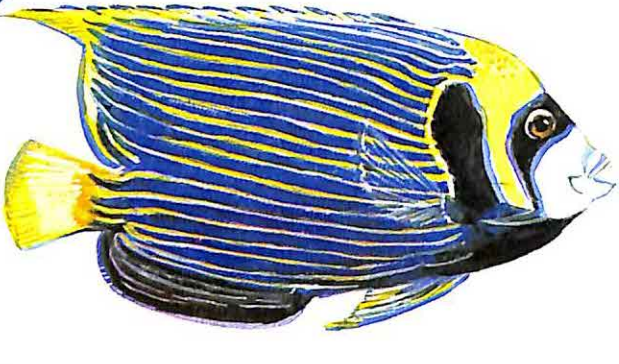
Koran Fish (juvenile)
(Pomacanthodes semicirculatus) × 1



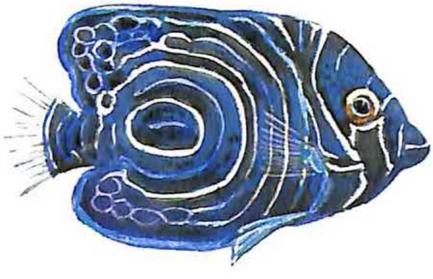
Blue-ring Angel Fish (adult)
(Pomacanthodes annularis) × ¼



Blue-ring Angel Fish (juvenile)
(Pomacanthodes annularis) × 1

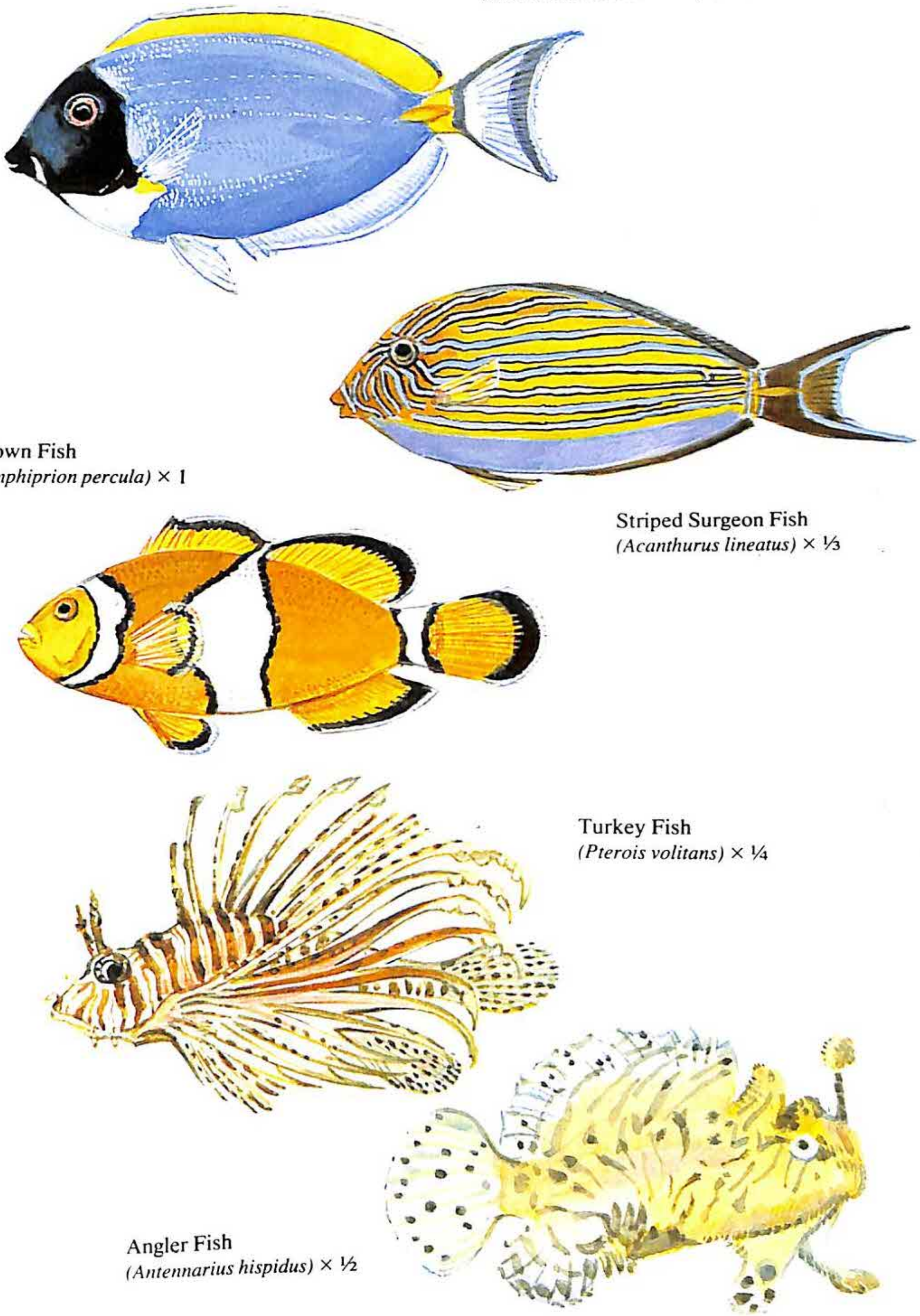


Emperor Angel Fish (adult)
(Pomacanthodes imperator) × ¼



Emperor Angel Fish (juvenile)
(Pomacanthodes imperator) × 1

PLATE II



Blue Surgeon Fish
(Acanthurus leucosternon) × ½

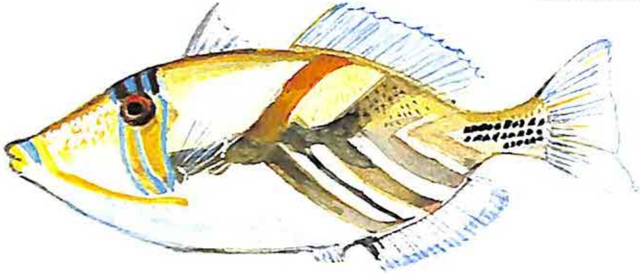
Striped Surgeon Fish
(Acanthurus lineatus) × ⅓

Clown Fish
(Amphiprion percula) × 1

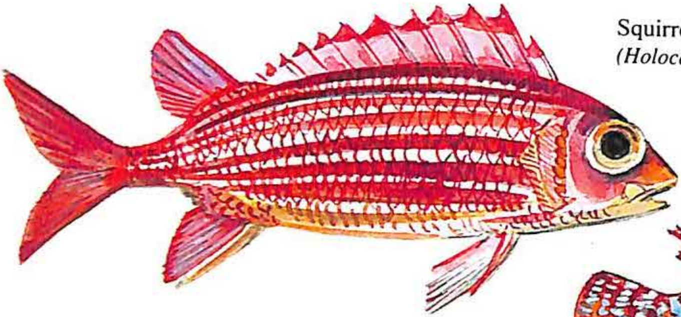
Turkey Fish
(Pterois volitans) × ¼

Angler Fish
(Antennarius hispidus) × ½

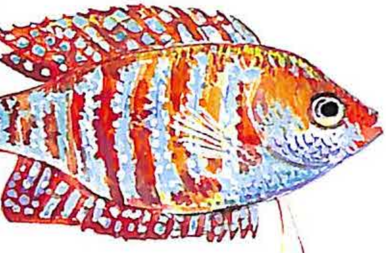
PLATE III



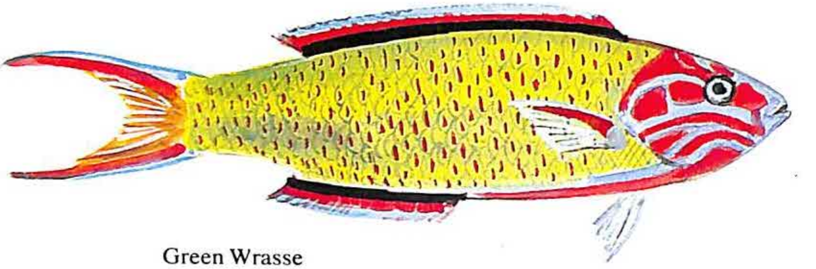
Picasso Trigger Fish
(Rhinecanthus aculeatus) × ¼



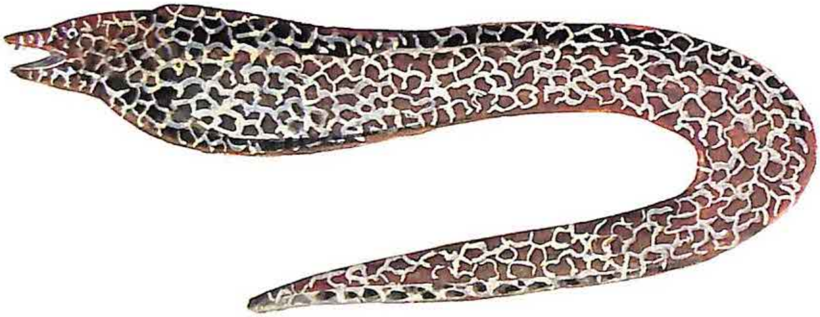
Squirrel Fish
(Holocentrus rubrum) × 2/5



Dwarf Gourami (fresh water)
(Colisa lalia) × 1½



Green Wrasse
(Thalassoma lunare) × ⅓



Painted Moray
(Gymnothorax favagineus) × 1/5

PLATE IV

tail. In most species, the males carry their large, yolk-filled eggs in their mouths for incubation. The dried swim-bladders of marine catfishes yield isinglass, a gelatinous product used to remove impurities from wine and for making jellies.

Macrones (Fig. 29) is the freshwater counterpart of *Tachysurus* but does not incubate its eggs in its mouth.

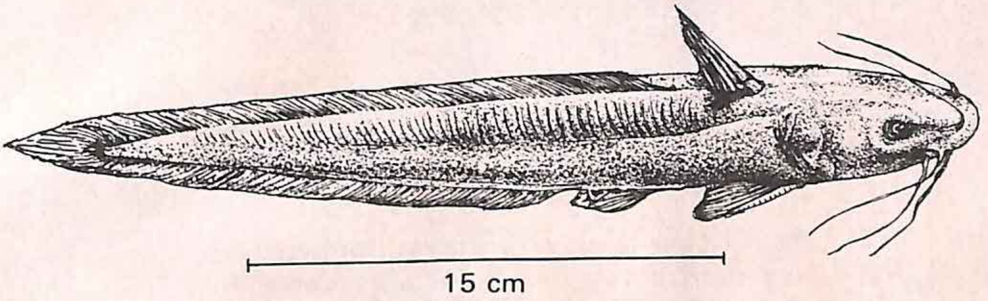


Fig. 30: Rock Catfish (*Plotosus anguillaris*)

The pretty but venomous marine, striped catfish (*Plotosus anguillaris*) (Fig. 30) move in large schools (groups). The long, rayed (set of bones supporting the fins) second dorsal and anal fins are fused with the tail to form a continuous fringe around the body. There is no adipose fin.

Freshwater catfishes, *Clarias batrachus* and *Heteropneustes fossilis*, have a special breathing chamber richly supplied with blood-vessels. These two types are, therefore, amphibious and can breathe air like terrestrial animals; in fact they choke to death if they are not allowed to come up to the surface of water.

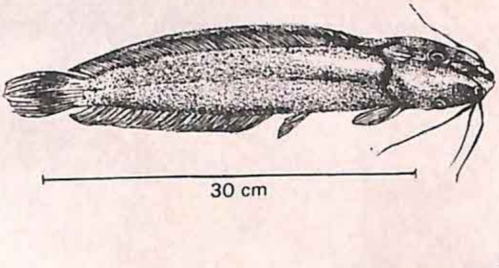


Fig. 31: Magur (*Clarias batrachus*)

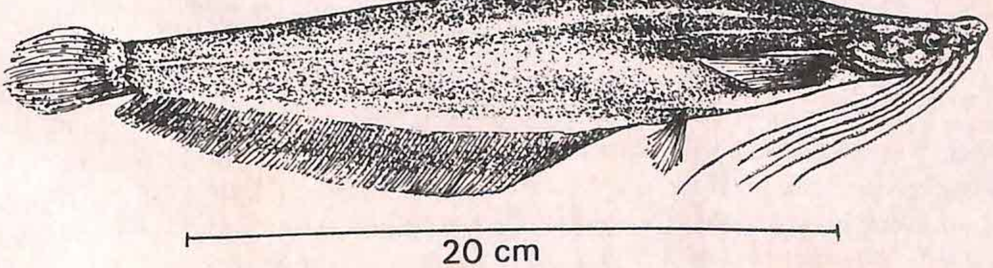


Fig. 32: Stinging Catfish (*Heteropneustes fossilis*)

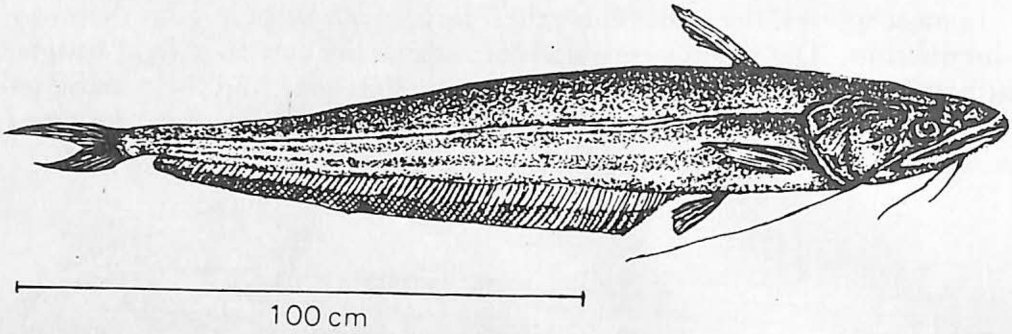


Fig. 33: Mulley (*Wallago attu*)

While *Clarias* (Fig. 31) has long, rayed dorsal and anal fins, *Heteropneustes* (Fig. 32) has a very short dorsal fin. Both lack adipose fins. The freshwater *Ompok* and *Wallago* (Fig. 33), have a similar short dorsal fin and long anal fins, but the tail is forked. The latter is known as 'freshwater shark' because of its wide, gaping mouth and voracious feeding habits. Although it grows to a fairly large size (over 1.5 metres), the giant among catfishes is the freshwater 'goonch' (*Bagarius*) which grows to a length of 1.8 metres.

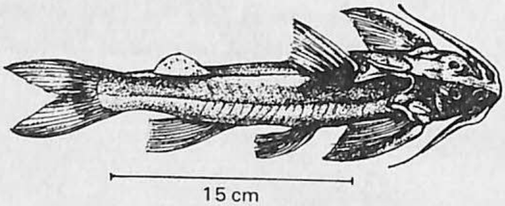


Fig. 34A: Hill Stream Catfish
(*Glyptosternum conirostris*)
(From the side)

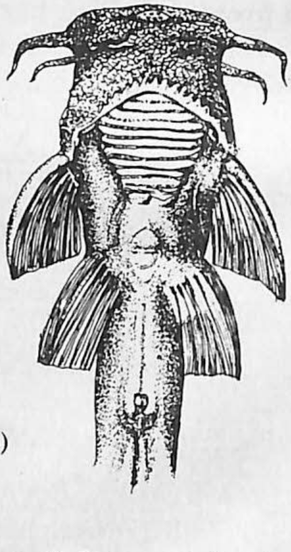


Fig. 34B: Hill Stream Catfish
(*Pseudecheneis*)
(From below, showing adhesive pad)

Then we have small catfishes living in clear, torrential mountain streams, typified by the genus *Glyptosternum* and *Pseudecheneis* (Fig. 34A & 34B) which have an adhesive pad formed by parallel ridges on the skin of the chest region. These help the fish to avoid being carried away by the swift current.

EELS, MORAYS, CONGERS

Order ANGUILLIFORMES

Eels (*Anguilla*) (Fig. 35) have a long, tubular snake-like body. They are catadromous, i.e. they breed in the sea and the young then ascend rivers and streams to grow in fresh water. In this respect, they are the opposites of the anadromous (breed in rivers and live in the sea) salmon.

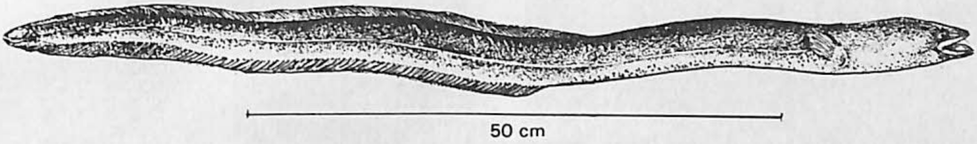


Fig. 35: Eel (*Anguilla bicolor*)

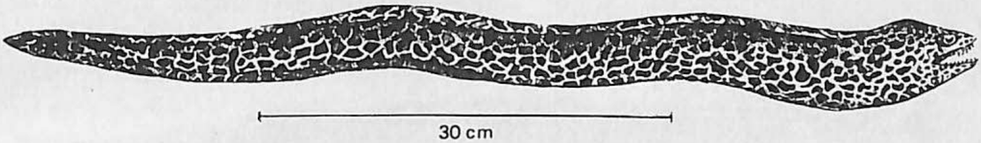


Fig. 36: Moray (*Gymnothorax tessellata*)

The morays (*Gymnothorax*) (Fig. 36) have a similar snakelike body. They lack scales as well as pectoral and pelvic fins, and swim with a sinuous motion resembling that of snakes. They breathe by gulping water into their mouth, which is then closed and the water expelled through small gill openings. Thus they appear to be perpetually yawning. They hide in crevices of rocks or corals in the sea. Their mouth is equipped with many sharp teeth which, with their poor eyesight, vicious temper and aggressive habits, make them formidable enemies. Their flesh was considered a delicacy by the ancient Romans, who used to stock them in special ponds, but their blood, if uncooked, is poisonous.

A very elongated cousin of the morays is the conger eel (*Congresox talabonoides*), a marine fish with a white belly and golden-yellow fins. The long snout, resembling that of a crocodile, curves downward at the tip and is equipped with long canine teeth and other outwardly directed teeth on the lower jaw. Their flesh is highly thought of and, therefore, is expensive.

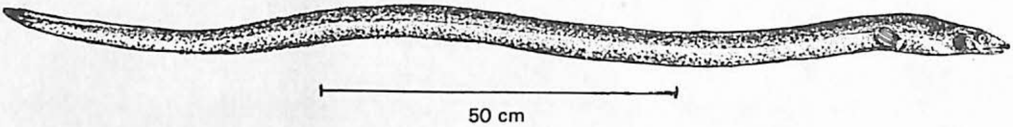


Fig. 37: Snake Eel (*Pisodonophis boro*)

The snake eels (*Pisodonophis, Ophichthys*) (Fig. 37), marine fish, are small, pencil-like fish which seem to be a favourite item of food for sea snakes.

GARFISHES, HALF-BEAKS, FLYING FISH
Order Beloniformes

Garfishes (*Strongylura*) (Fig. 38), predominantly marine, are small (less than one metre in length) elongated fishes in which both the jaws are elongated to form a long 'beak'. Their bones are green in colour. In the half-beaks (*Rhynchorhamphus*) (Fig. 39), also predominantly marine, only the lower jaw is elongated.

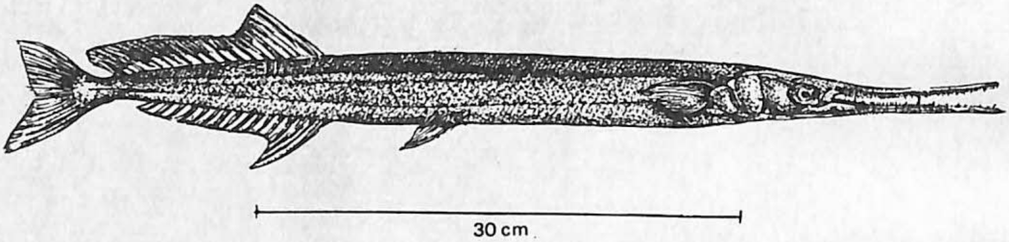


Fig. 38: Garfish (*Strongylura strongylura*)

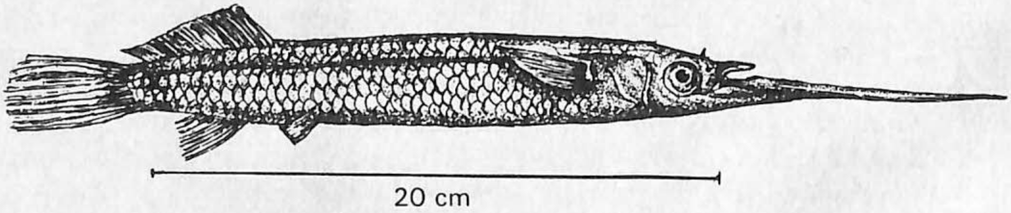


Fig. 39: Half-Beak (*Rhynchorhamphus georgii*)

Flying fish (marine) have their pectoral fins elongated into 'wings', and these are supported by stout finrays. In the two-winged flying fish (*Exocoetus*) (Fig. 40) the pelvic fins are small, but in the four-winged *Cypselurus* these are also

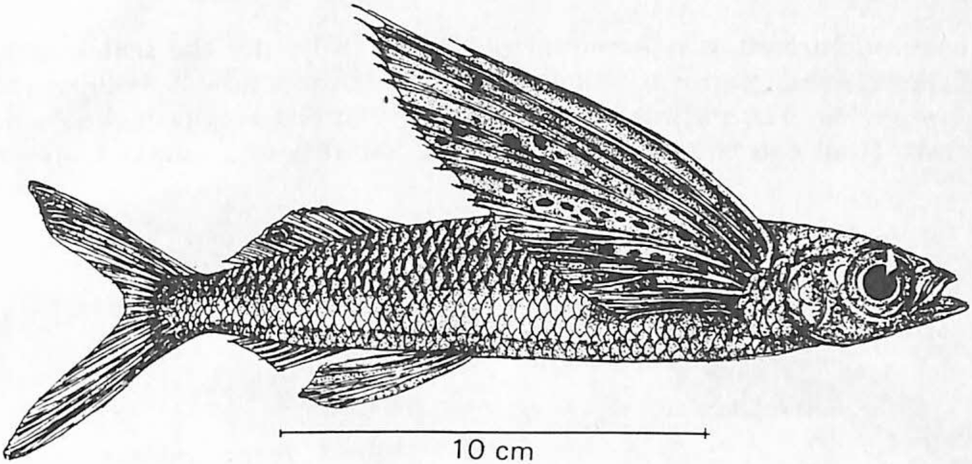


Fig. 40: Flying Fish (*Exocoetus volitans*)

enlarged, though less so than the pectorals. The lower lobe of the tail is well-developed, and by its sculling motions the fish takes off to glide above the water for over a hundred metres.

COD
Order GADIFORMES

In this Order, which includes the Atlantic cod famous for its liver oil, Indian representatives are meagre. *Bregmaceros mcclellandi* (marine) (Fig. 41) is a small fish predominantly eaten by Bombay duck. *Fierasfer* (marine), an extremely slender fish, is noted for its unusual habit of living inside sea cucumbers, entering the latter tail-first.

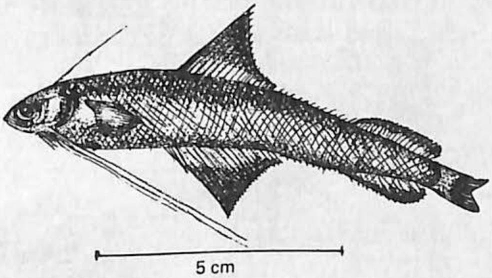


Fig. 41: Unicorn Cod (*Bregmaceros mcclellandi*)

SEAHORSE, PIPEFISH

Order SYNGNATHIFORMES

The most interesting representatives of this Order are the seahorses and pipefishes, predominantly marine except for a few pipefish. A seahorse (*Hippocampus*) (Fig. 42), with its head resembling that of a knight in chess, and a prehensile (that can coil round to hold) tail like that of a monkey, does not resemble a fish at all. Moving slowly in an upright position by means of the rapidly vibrating, transparent dorsal fin, it coils its tail around a seaweed whenever it wishes to rest. Both its eyes can rotate independently, and it is startling and amusing to watch a seahorse looking ahead with its left eye, while the right eye is focussed backward to detect enemies. As if these odd characteristics are not enough, the male carries a pouch on its belly like a kangaroo. The female, while mating, passes her eggs (and her responsibility!) to this pouch where they are incubated, so that ultimately the young are born from the father and not from their mother! Dried seahorses are commonly sold as curios.

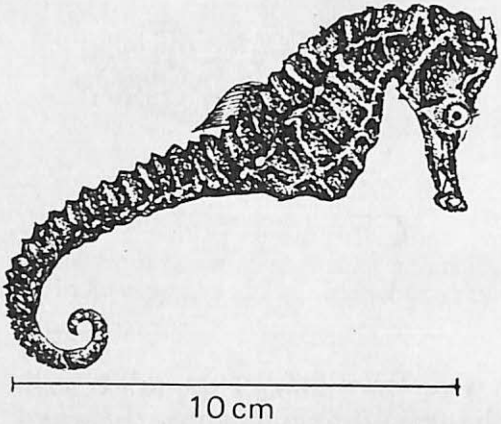


Fig. 42: Seahorse (*Hippocampus kuda*)

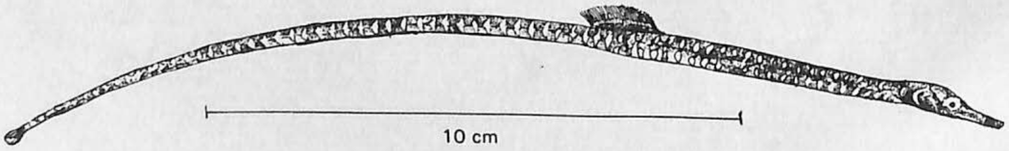


Fig. 43: Pipefish (*Syngnathus spicifer*)

The pipefish (*Syngnathus*) (Fig. 43) has an extremely elongated, tubular body. The eggs are deposited between two long flaps on the father's belly, rather than in a pouch. Both the seahorse and the pipefish have their body encased in an armour made of hard, bony plates and rings.

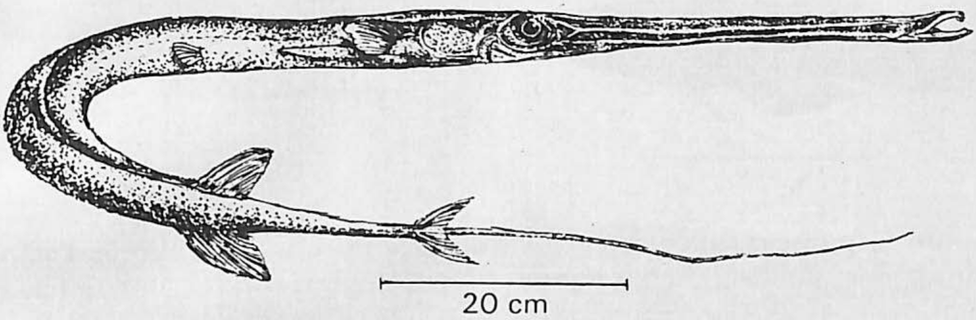


Fig. 44: Flutemouth (*Fistularia serrata*)

The flutemouth (*Fistularia*) (Fig. 44), a marine fish, has an extremely long tubular mouth. Between the two forks of its tail is a threadlike extension. The fish grows to a length of 1.5 metres.

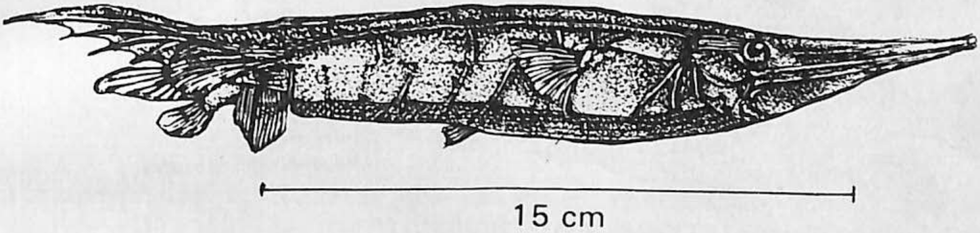


Fig. 45: Snipe Fish (*Centriscus scutatus*)

Centriscus scutatus (Fig. 45) is an oddly shaped flat fish, with a tubular mouth and a razor sharp belly. The body is covered by bony plates which are expansions of the backbone. The stout first spine of the dorsal fin forms the hind tip of the body, so that the major part of the dorsal fin and the tail fin are on the lower surface of the fish. The fish swim in small shoals, head down and tail up, among fronds of seaweeds.

TOP-MINNOWS
Order CYPRINODONTIFORMES

The top minnows are mainly represented in America, Africa and Europe. Only three species of the genus *Aplocheilus* (Fig. 46) are found in peninsular

India and there are no fish belonging to this Order in the rest of Asia. These small freshwater fish swim near the surface of the water, their mouth directed upward, a position suited to catching surface insects. They also feed on mosquito larvae, and are therefore useful for biological control of malaria.

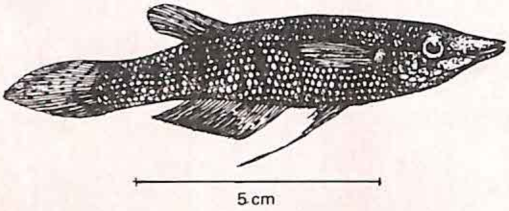


Fig. 46: Top Minnow
(*Aplocheilus lineatus*)

SQUIRRELFISH
Order BERYCIFORMES

Squirrelfish or soldierfish (*Holocentrum*) (Fig. 47) are aptly named after the red and white horizontal stripes on the body. The head is broad and wedge-shaped, with very large eyes. Many species live in our seas.

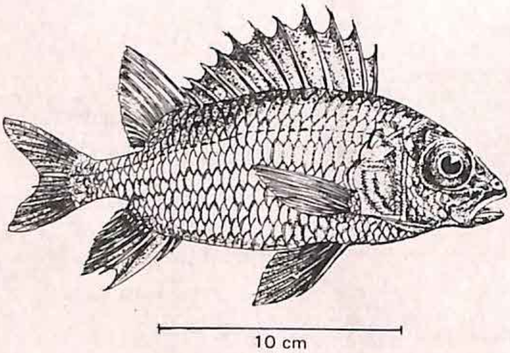


Fig. 47: Squirrelfish
(*Holocentrum rubrum*)

MULLETS, BARRACUDAS
Order MUGILIFORMES

Mullets (*Mugil*) (Fig. 48) are sleek-bodied, silvery marine and estuarine fish (a few species enter fresh water), with large shimmering scales. They are noted as food fish.

Surprisingly, the rapacious barracuda (*Sphyraena*) (Fig. 49), a marine fish, is related to the placid mullets. Growing to three metres in length, the superbly streamlined body is capable of short bursts of speed. Aqualung divers are more

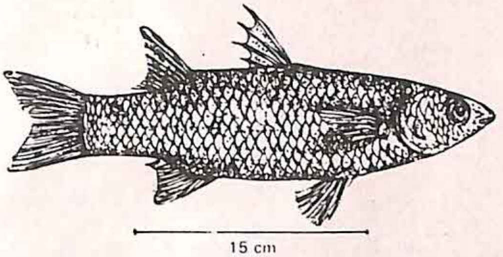


Fig. 48: Mullet (*Mugil cephalus*)

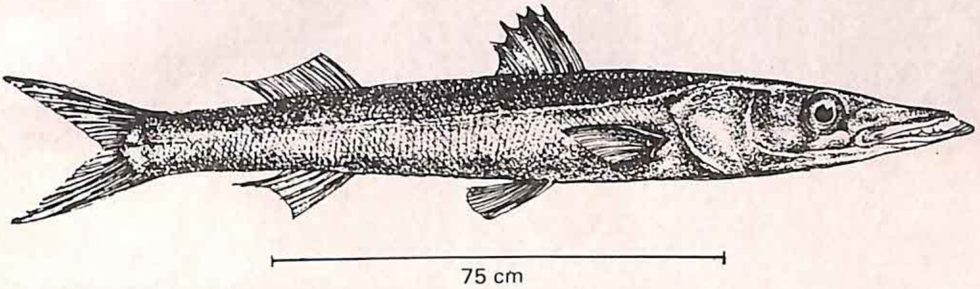


Fig. 49: Barracuda (*Sphyraena jello*)

afraid of it than of sharks because of its long mouth armed with large and sharp canine teeth and its utterly fearless nature.

THREADFINS
Order POLYNEMIFORMES

These are all medium to large marine, prime food fish. Called Threadfins (*Polydactylus*) (Fig. 50) because of the long filamentous extensions of their pectoral fins, they are usually sold sliced up in fish markets. The so-called Indian salmon or Bahmin (*Eleutheronema tetradactylum*) is a misnomer as it is not even remotely related to the salmon and does not ascend rivers to breed.

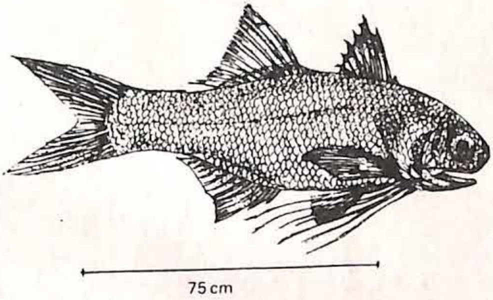


Fig. 50: Threadfin
(*Polydactylus heptadactylus*)

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SNAKEHEAD OR MURREL

Order OPHICEPHALIFORMES

Snakeheads or murrels (*Channa*) (Fig. 51), freshwater fish, have an elongated sub-cylindrical body with pretty black and yellow blotches. The head and eyes resemble those of a snake, and they have a voracious appetite. Like some varieties of catfish, they too can breathe air. The larger species grow to a metre in length and the flesh is highly prized as food.

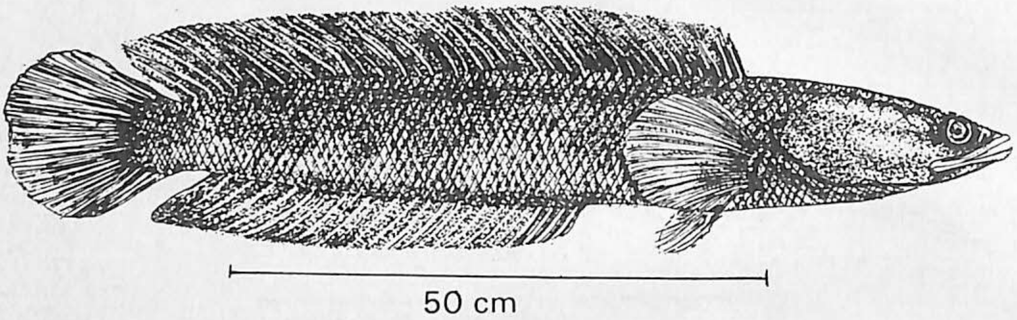

Fig. 51: Murrel or Snakehead (*Channa leucopunctata*)

PERCHES

Order PERCIFORMES

This large, predominantly marine, Order contains many suborders and nearly a hundred families.

GROUPERS, SNAPPERS, CROAKERS, ETC.

Suborder PERCOIDEI

The cock-up (*Lates calcarifer*) (Fig. 52) can be distinguished from other sea perches by the concave profile of its neck region. Growing to 1.5 metres in length, it can adapt well to fresh water though it cannot breed there. Its flesh is a delicacy.

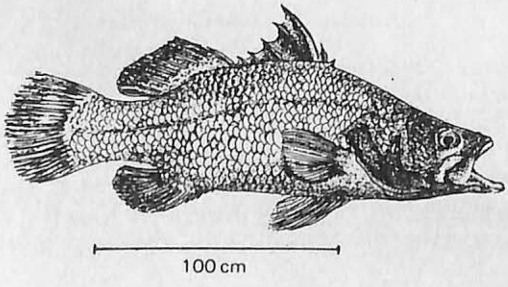

Fig. 52: Cock-up (*Lates calcarifer*)

Glassfish (*Chanda*) (Fig. 53) have a transparent body through which the backbone and ribs can easily be seen. Found in brackish (slightly salty) water, they are popular home aquarium pets.

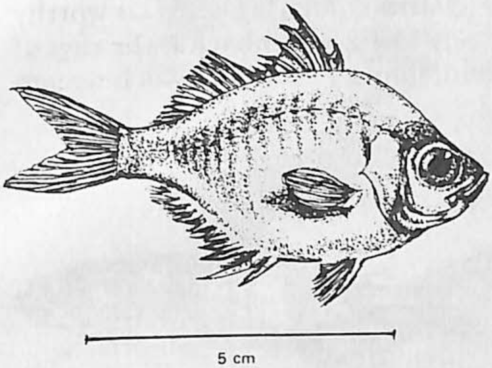

Fig. 53: Glassfish (*Chanda lala*)

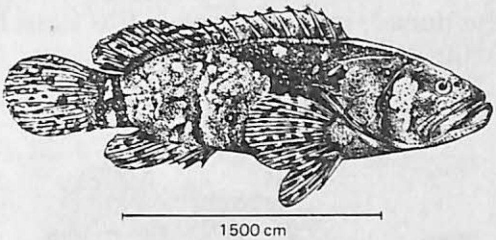

Fig. 54: Grouper (*Promicrops lanceolatus*)

Groupers (*Epinephalus*) (Fig. 54) are a large family of marine perches, usually with their blotched body colouration well adapted for camouflage. The spots and stripes can vary in intensity with the mood of the fish. The largest species (*Promicrops lanceolatus*) grows to over 3.5 metres in length, and a pair is almost invariably found making a home in sunken ships. When full grown, its mouth can easily engulf a man.

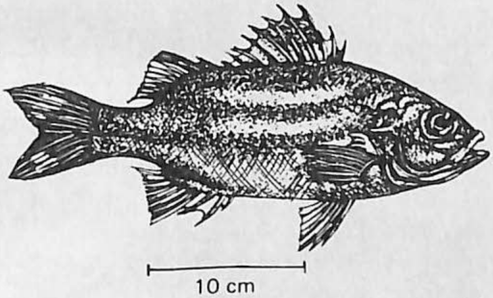

Fig. 55: Target Perch (*Therapon jarbua*)

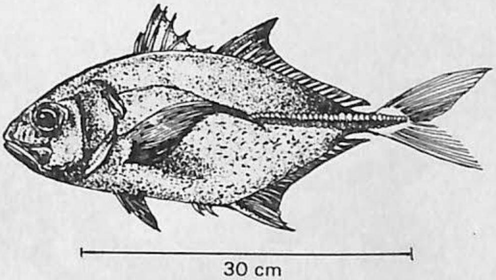

Fig. 56: Horse Mackerel (*Alepes kalla*)

The target perch (*Therapon jarbua*) (Fig. 55) is a small (20-centimetre) but agile fish found in brackish water, with parallel, curved, chocolate-brown bands on a white body. When viewed from above, the bands look like an archery target with the black blotch on the dorsal fin forming a bull's-eye.

Horse-mackerel and trevallies (family *Carangidae*) (Fig. 56), marine fish, constitute an abundant and relatively important food crop in the tropics. They are distinguished from mackerels by the absence of many detached finlets behind the dorsal and anal fins. The scales along the rear half of the lateral line are enlarged to form hard, pyramidal bony plates (prismatic scutes). Among the numerous species, the threadfin trevally (*Alectis ciliaris*) (Fig. 57) is worthy of mention. With an angular, rhomboidal body like a hunchback's, the rays of the dorsal, anal and pelvic fins form long, filamentous extensions which stream behind the fish while it swims.

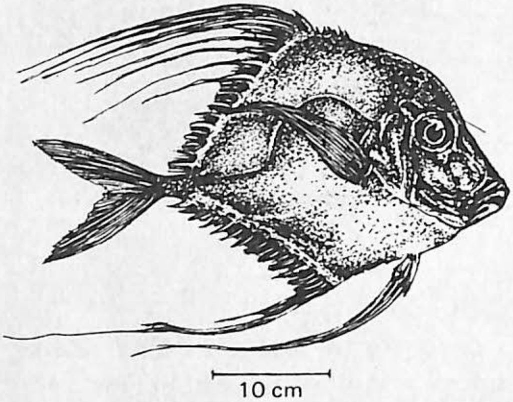

Fig. 57: Trevally (*Alectis ciliaris*)

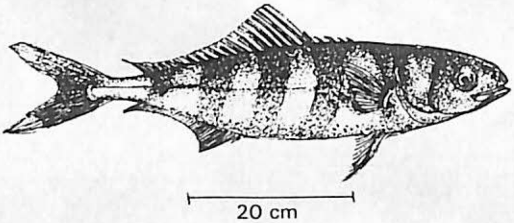

Fig. 58: Pilotfish (*Naucrates ductor*)

The pilotfish (*Naucrates ductor*) (Fig. 58), a torpedo-shaped marine fish with six to seven dark vertical bars on its body, accompanies sharks, while the young take shelter under jellyfish.

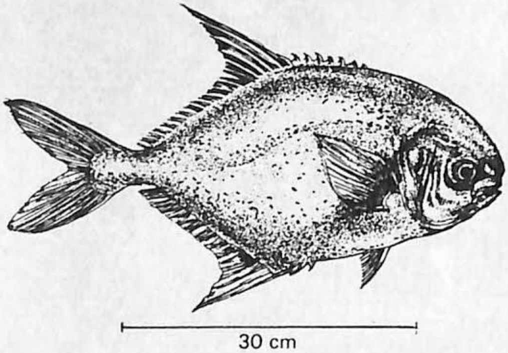

Fig. 59: Pampano, Butterfish (*Trachynotus ovatus*)

The butterfly or imitation pomfret (*Trachynotus ovatus*) (Fig. 59), a marine fish, has a body superficially resembling that of a silver pomfret, but the yellow fins and rounded profile of the back are distinctive.

The kingfish (*Rachycentron canadus*) (Fig. 60) lives in the sea and superficially resembles the sucker-fish because of its shape and the dark horizontal bands that run across it, but lacks the sucker.

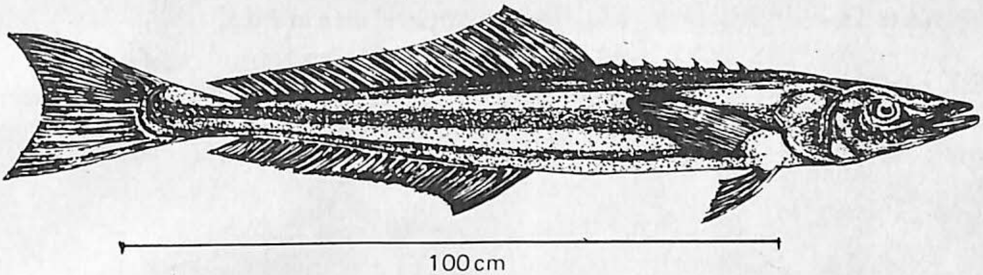

Fig. 60: Kingfish (*Rachycentron canadus*)

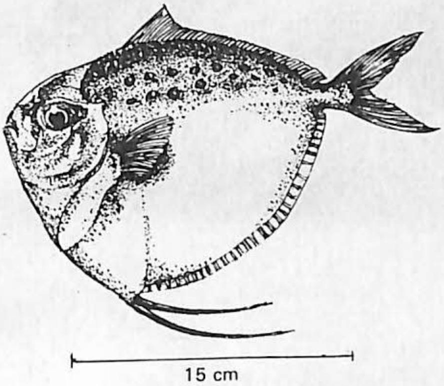

Fig. 61: Moonfish
(*Mene maculata*)

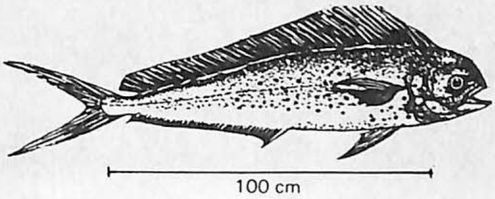

Fig. 62: Dolphin Fish
(*Coryphaena hippurus*)

The moonfish (*Mene maculata*) (Fig. 61), a marine fish, has an asymmetric body with a flat back and large protruding belly. It should be more appropriately termed 'hatchet fish'.

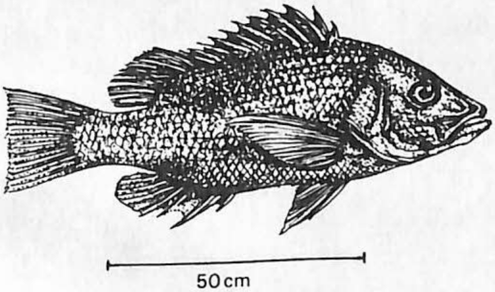

Fig. 63: Snapper
(*Lutianus johnii*)

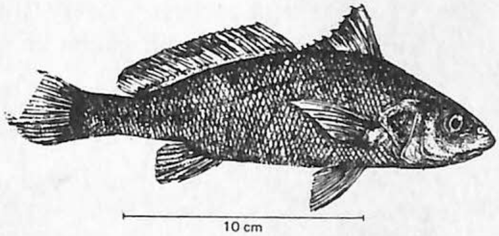

Fig. 64: Jewfish
(*Protonibea diacanthus*)

The dolphin fish (*Coryphaena hippurus*) (Fig. 62), marine, has a tall, sail-like dorsal fin. Old males have a prominent hump on their foreheads. The changes in colouration as the fish dies are fascinating. It grows to a length of 1.5 metres.

Snappers (*Lutianus*) (Fig. 63), like groupers, are a large family of marine fish with firm, tasty flesh. Equally abundant are the croakers (*Johnius*) and jewfish (*Protonibea*) (Fig. 64) which live at the sea bottom and are considered the poor man's fish as they have a relatively poor flavour and are consequently inexpensive.

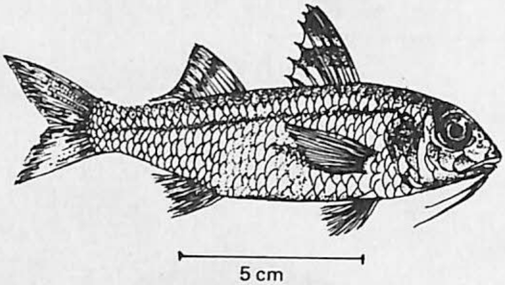

Fig. 65: Goatfish
(*Upeneus sulphureus*)

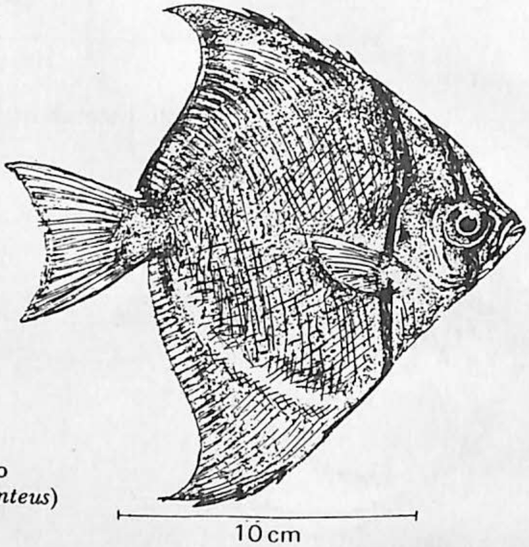

Fig. 66: Ceylon Angel, Mono
(*Monodactylus argenteus*)

Goatfish (*Upeneus*) (Fig. 65), marine fish, are so called because of the two long barbels on the chin. They are usually brightly coloured.

The so-called Ceylon angel (*Monodactylus argenteus*) (Fig. 66) is a silvery estuarine fish with a compressed body and blunt, finger-like tips to the dorsal and anal fins. Like all brackish water fish, they can live comfortably in fresh water and hence, are popular with aquarists under the name 'mono'.

The archerfish (*Toxotes*) (Fig. 67), also found in brackish waters, has the remarkable ability to bring down insects flying in the air by shooting out with force well-aimed drops of water from the mouth.

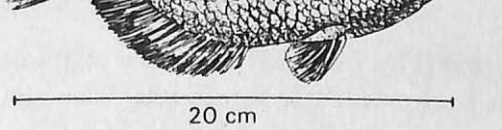

Fig. 67: Archerfish
(*Toxotes jaculator*)

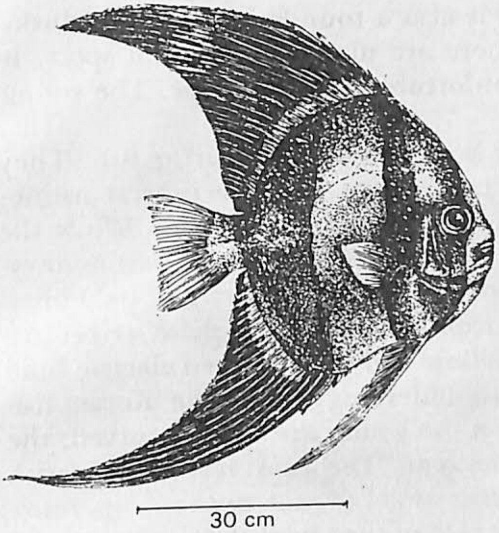

Fig. 68: Batfish (*Platax teira*)

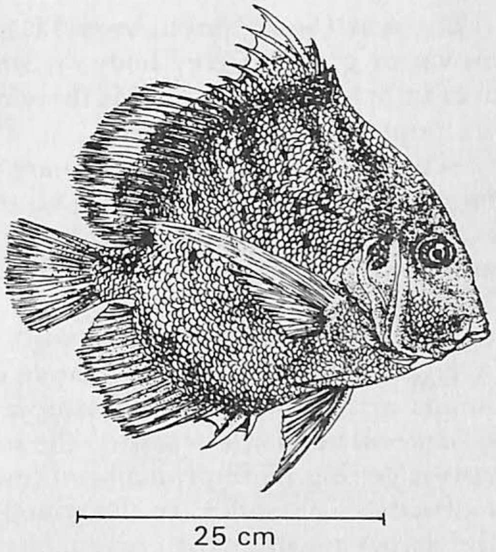

Fig. 69: Spotted Dory (*Drepane punctata*)

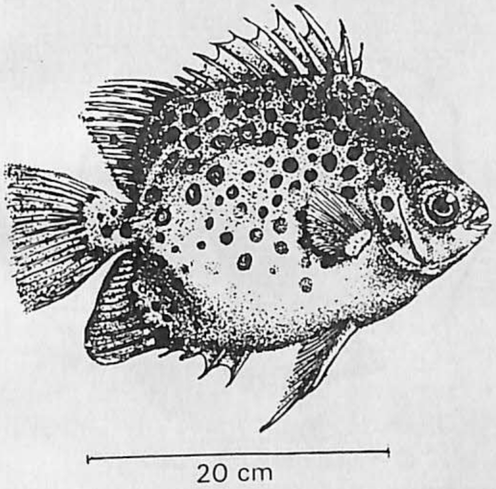

Fig. 70: Scat (*Scatophagus argus*)

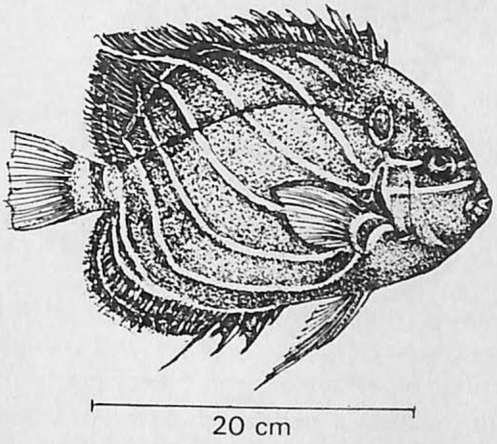

Fig. 71: Bluering Angelfish
(*Pomacanthus annularis*)

The batfish (*Platax teira*) (Fig. 68), a marine fish, is flattened on each side and is white with three broad, brownish-black vertical bands. In the young, the blunt dorsal and anal fins are quite long and resemble the wings of a bat, which gives the fish its name.

The Dory (*Drepane punctata*) (Fig. 69), a marine fish, with a round, silvery body, gleams like the full moon. It has a series of black dots arranged in parallel vertical rows.

The scat (*Scatophagus argus*) (Fig. 70) is also a rounded fish with a dusky brown or greenish-grey body on which there are many large round spots. It lives in brackish water and is therefore comfortable in fresh water. The young are popular aquarium pets.

Sea angelfish (*Pomacanthus*) are pretty but quarrelsome marine fish. They have a curved, daggerlike spine on the gill covers, and strong territorial instincts. Many colourful species abound in the oceans surrounding India. While the adults have a variety of patterns of colour, the young in all species start as navy-blue fishes with parallel, straight or curved, alternatively white and pale blue, stripes. In the young bluering angel (*Pomacanthus annularis*) these stripes are straight. The adult (Fig. 71) has an olive-yellow body with curved electric blue bands across it and a blue ring in the shoulder region. In the Koran fish (*Pomacanthus semicirculatus*) the stripes on the young are slightly curved, the curves getting more pronounced toward the rear. The adult is drab grey with mottled brown scales. In the young emperor angel (*Pomacanthus imperator*) the stripes are still more curved, one at the root of the tail even forming an oval ring. The adult has many oblique, parallel white stripes on a purple body. Across the eyes there is a dark band like a bandit's mask, with a saddle-shaped shoulder patch of the same colour (See colour Plate II).

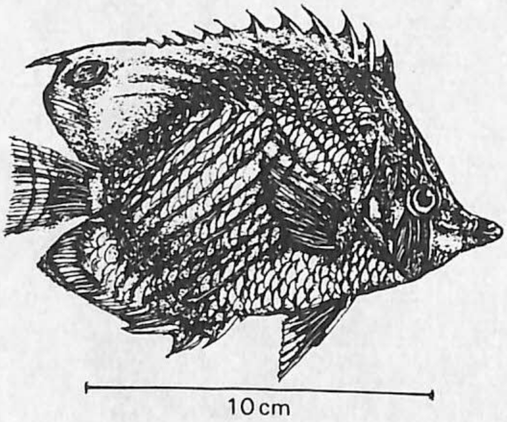

Fig. 72: Butterfly Fish
(*Chaetodon auriga*)

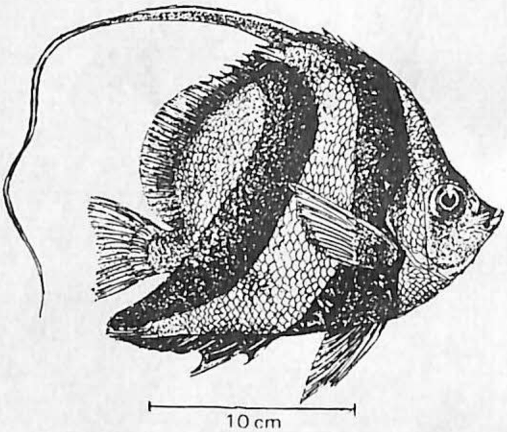

Fig. 73: Pennant Fish
(*Heniochus acuminatus*)

Butterfly fish (*Chaetodon*) (Fig. 72), marine fish, are all prettily coloured, and their habit of flitting from one coral head to another, like butterflies sipping nectar, gives them their name. In most species a dark band passing through the eye camouflages it, while a prominent round spot near the tail looks like an eye to confuse its enemies. Its tubular mouth helps it pick out worms and other food from the crevices of corals and stones.

The marine pennant fish (*Heniochus acuminatus*) (Fig. 73) looks as if a chunk of flesh has been bitten off from the rear end of its body. The dorsal fin is elongated into a long streamer.

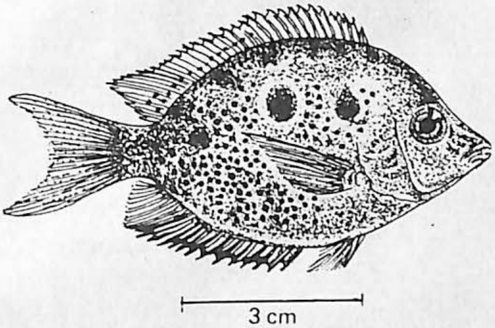

Fig. 74: Orange Chromide
(*Etroplus maculatus*)

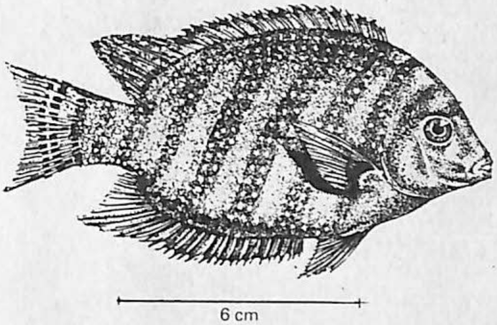

Fig. 75: Pearl Spot
(*Etroplus suratensis*)

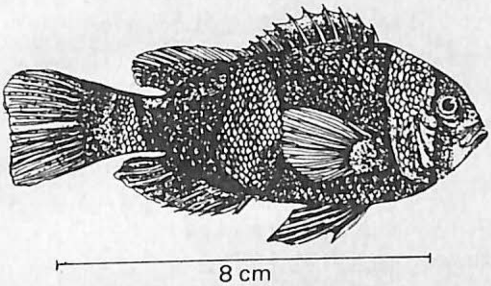

Fig. 76: Clown Fish or Anemone Fish
(*Amphiprion sebae*)

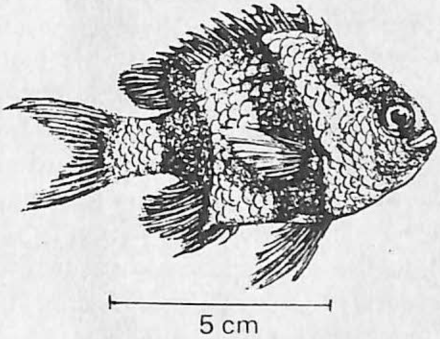

Fig. 77: Damselfish
(*Dascyllus aruanus*)

The family Cichlidae is a large one with representatives living in Central and South America as well as Africa. It has only two brackish water representatives in India, viz. the orange chromide (*Etroplus maculatus*) (Fig. 74) and the pearl spot (*Etroplus suratensis*) (Fig. 75). In addition to these native cichlids, the African mouthbrooder (*Oreochromis mossambicus*) has been introduced along our coastal areas. In this estuarine fish which can also live and breed in fresh water, the eggs after being laid and fertilized are kept by the female inside her mouth until they hatch.

Clown fish (*Amphiprion*) (Fig. 76) are marine fish which have developed a unique relationship with sea anemones. A pair of these fish will hover near a sea anemone, not venturing far from it. At the least sign of danger they will nestle snugly amongst the sea anemone's tentacles which can paralyze and kill other fish. But the clown fish is immune to its venom.

The damselfish (*Pomacentrus, Dascyllus*) (Fig. 77) and sergeant major

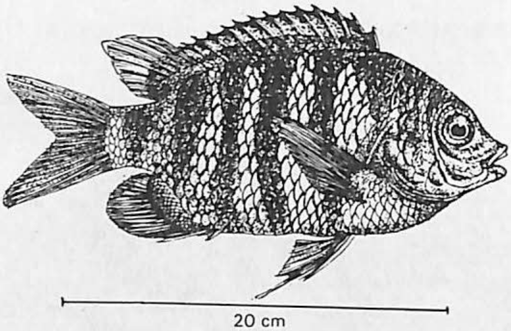

Fig. 78: Sergeant Major
(*Abudefduf saxatilis*)

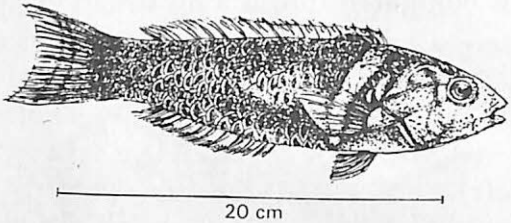

Fig. 79: Wrasse
(*Thalassoma hebraicum*)

(*Abudefduf saxatilis*) (Fig. 78), both marine fish, are related to clownfish. The latter have a series of parallel vertical black stripes on a sea-green body.

Wrasses (family Labridae) (Fig. 79) are a large group of prettily coloured fish. The most interesting member of this group is the cleaner wrasse (*Labroides dimidiatus*). A tiny, lively, blue and black striped fish, it sets up a 'station' near a rock or coral head from which it does not venture far. Fish with parasites on their bodies or with infected wounds seem to know the locations of these stations and visit them. They indicate their desire to be cleaned by changing their body colouration and adopting weird postures, such as standing head down. The wrasse boldly approaches the affected fish and picks off parasites or dead (necrotic) tissue which is its predominant food. It even goes inside the gill chamber or mouth to clean up. The large fish can easily swallow the wrasse but does not do so. If a fish visiting the 'station' to be cleaned finds that the wrasse is busy cleansing another fish, it will patiently await its turn!

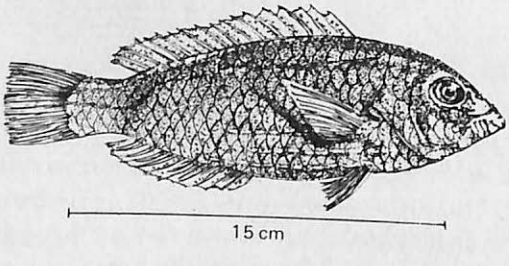

Fig. 80: Parrot Fish
(*Callyodon sordidus*)

Parrot fish (*Callyodon*) (Fig. 80) are marine fish which superficially resemble wrasses in body shape. Their teeth are, however, fused together to form a powerful 'beak', like that of a parrot. This is used to break off pieces of hard coral which are then eaten. Many parrotfish lie down on their sides on the sea bottom at night to sleep; some secrete a coating of slime, inside which they sleep, as in a tent.

RABBITFISH, TANG, SURGEON FISH
Suborder SIGANOIDEI

Rabbitfish (*Siganus*) are marine fish, so named from the manner in which they constantly twitch their lips. A typical representative is the jigsaw puzzle fish (*Siganus vermiculatus*) (Fig. 81) on whose body there is a complicated design, as if an artist had painted a maze. Seaweed is their favourite food.

The Moorish idol (*Zanclus cornutus*) (Fig. 82) is a marine fish that superficially resembles the pennant fish (*Heniochus*), described earlier, in its colour pattern and long dorsal fin. But the shape of its body is different.

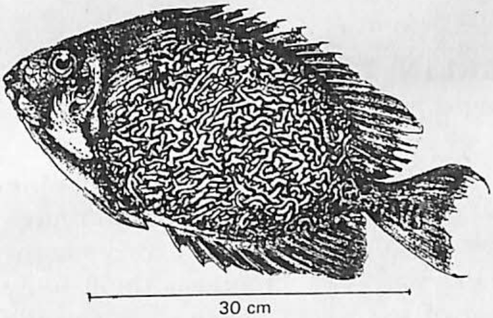

Fig. 81: Rabbit Fish or Jigsaw Puzzle Fish
(*Siganus vermiculatus*)

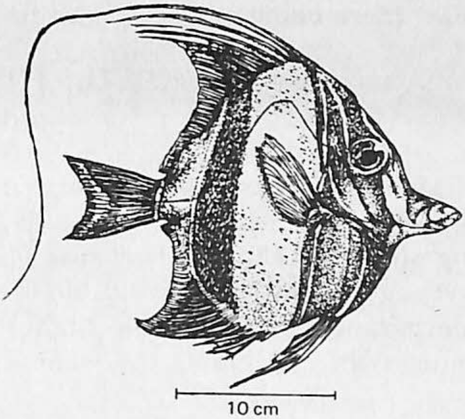

Fig. 82: Moorish Idol
(*Zanclus cornutus*)

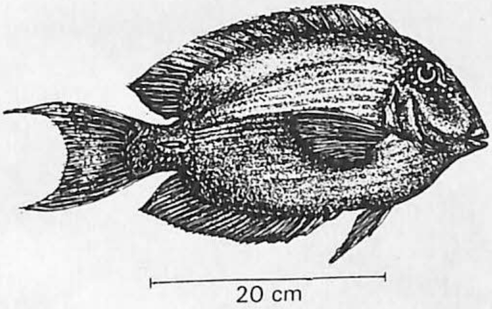

Fig. 83: Surgeonfish
(*Acanthurus strigosus*)

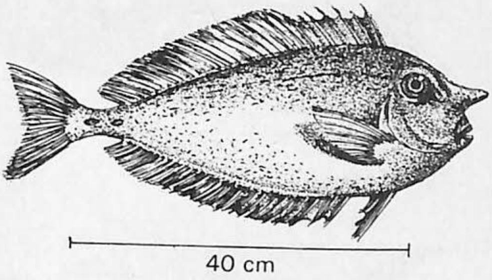

Fig. 83A: Unicorn Fish
(*Naso brevirostris*)

In surgeonfish (*Acanthurus*) (Fig. 83), a marine fish, the root of the tail bears,on each side, one or sometimes two sharp spines. Normally they are folded inside the body but, when the fish feels threatened, these spines open out like the blades of a pen-knife and can inflict a nasty cut, as from a surgeon's scalpel. Some of these fish (*Naso*) have a horizontal lobe protruding in front of the eyes, and are therefore called unicorn fish (Fig. 83A).

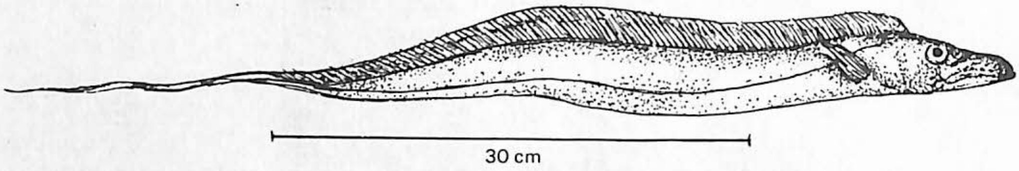

Fig. 84: Ribbonfish (*Trichiurus savala*)

Ribbonfish (*Trichiurus*) (Fig. 84) are elongated, flat-bodied, silvery marine fish growing to a metre or more in length. The body tapers to a point at the rear, there being no forked tail fin.

MACKEREL, TUNA, MARLIN, BILLFISH

Suborder Scombroidei

Mackerel (*Rastrelliger kanagurta*) (Fig. 85), like the sardine, is a shoaling fish of commercial importance. Tuna are larger cousins of the mackerel, roaming all over the tropical oceans. They are fast swimmers and are eagerly sought by anglers. Although cold-blooded animals, they can maintain their body temperature at 10°C or so higher than that of sea water. They comprise the tuna, skipjack, bonito and wahoo.

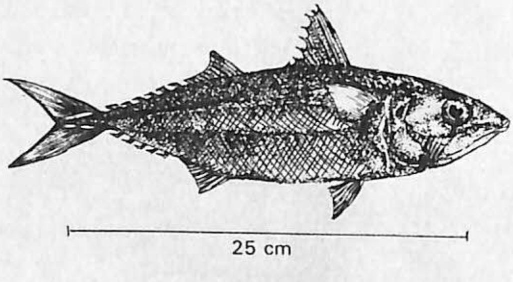

Fig. 85: Mackerel (*Rastrelliger canagurta*)

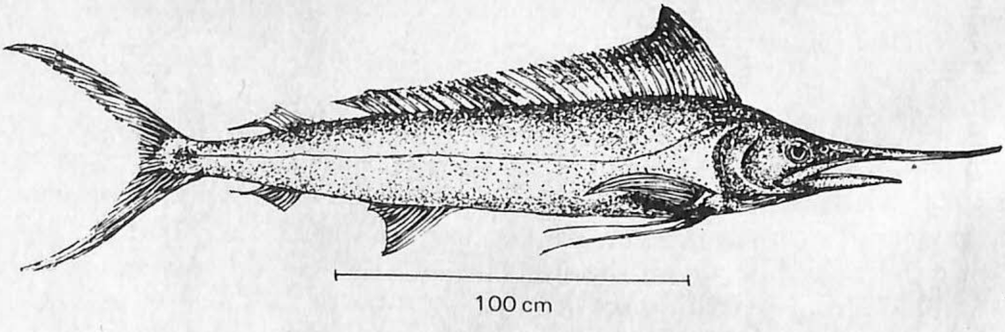

Fig. 86: Marlin, Spear Fish (*Makaira indica*)

Billfish (family Istiophoridae) are also fast swimmers, roaming tropical oceans and giving good sport when hooked. All have an upper jaw carrying a long, pointed snout. They are notorious for ramming boats and even ships with them, and then the snout often snaps off and remains buried in the wood. In the marlin or spearfish (*Makaira*) (Fig. 86) and the sail-fish (*Istiophorus*), the snout is rounded in cross-section, but in the swordfish (*Xiphias*) it is flattened. The sailfish has a very large, high dorsal fin which is retracted within a groove when the fish is swimming at speed, but which otherwise extends like a sail. All billfish have the disconcerting habit of protruding their stomachs outside the mouth, probably to get rid of offensive food.

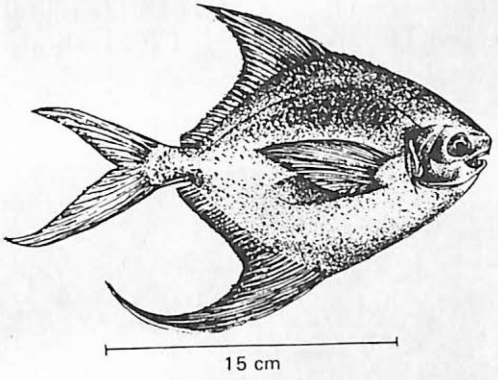

Fig. 87: Silver Pomfret
(*Pampus argenteus*)

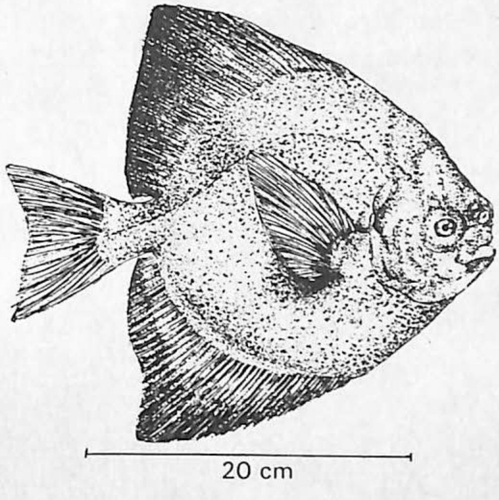

Fig. 88: White Pomfret
(*Pampus chinensis*)

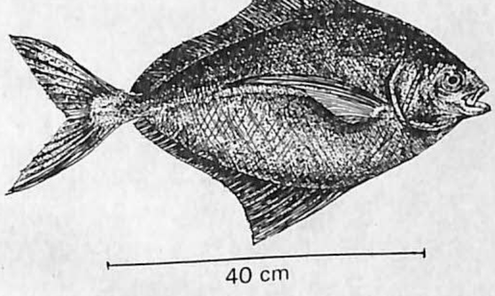

Fig. 89: Black Pomfret
(*Apolectus niger*)

Pomfrets are among the most esteemed table fish of our seas. There are silver (*Pampus argenteus*) (Fig. 87), white or Chinese (*Pampus chinensis*) (Fig. 88), and black (*Apolectus niger*) pomfrets (Fig. 89), the last named being the largest.

GOURAMIS, CLIMBING PERCH
Suborder ANABANTOIDEI

Air-breathing fish (family Anabantidae) live in freshwater and have what is known as a labyrinth organ – a much-folded extension of the upper gill chamber richly supplied with blood vessels. This enables the fish to breathe air directly. They come to the surface of the water, take a gulp of air and submerge themselves again. The gouramies (*Colisa*) (Fig. 90) are small, brilliantly coloured freshwater fish, some of which are native to India. During the breeding season the male gourami blows air bubbles, made sticky with saliva, on the surface of the water. The eggs are then laid in this bubble-nest and the male guards the nest against enemies, even chasing away the female! The giant gourami (*Osphronemus goramy*) (Fig. 91) is a native of Java which has been introduced into our country as a food fish.

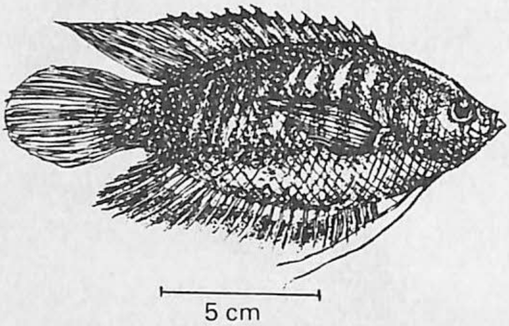

Fig. 90: Dwarf Gourami
(*Colisa lalia*)

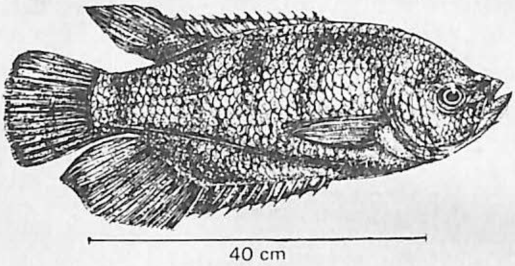

Fig. 91: Giant Gourami
(*Osphronemus goramy*)

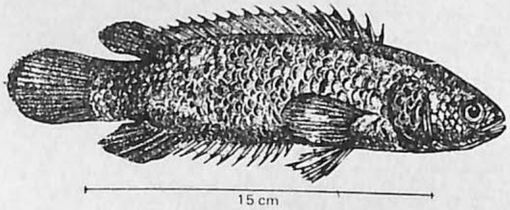

Fig. 92: Climbing Perch
(*Anabas testitudineus*)

The climbing perch (*Anabas testudineus*) (Fig. 92), a freshwater fish, is one of the anabantids which actually leaves water and 'walks' laboriously on land, using its pectoral fins to propel itself.

GOBIES, MUDSKIPPERS

Suborder GOBOIDEI

In gobies (*Awaous*) (Fig. 93) and mudskippers (*Periophthalmus*) (Fig. 94), a marine fish, the two pelvic fins unite to form a rounded sucking disc which enables the fish to cling to rocks. Mudskippers have eyes on the top of the head which can rotate in any direction and are equipped with an upper eyelid. The gill covers can completely seal the gill cavities, and a small amount of sea water retained inside enables the fish to remain outside water for a long time. These fish love to bask in the sun at ebb tide but, if disturbed, jump in agilely, using their fins to propel themselves.

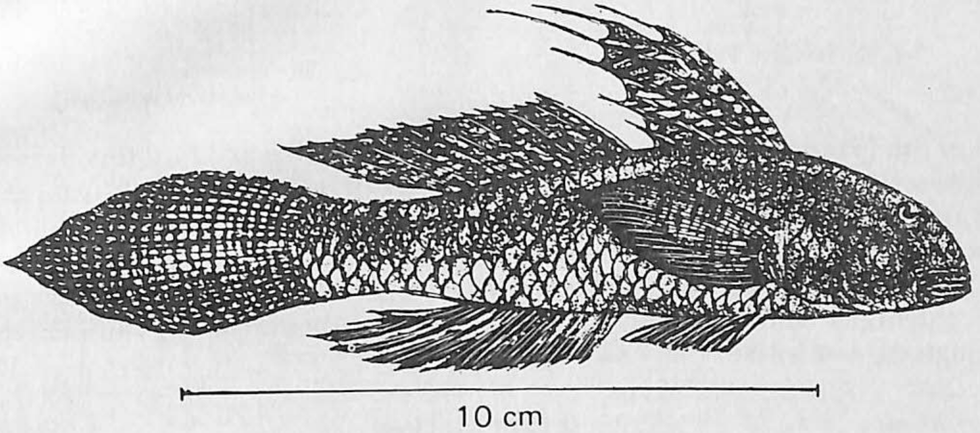

Fig. 93: Goby (*Awaous stamineus*)

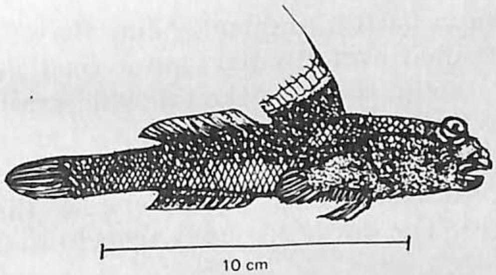

Fig. 94: Mudskipper (*Boleophthalmus boddaerti*)

Blennies look like gobies but are only distantly related to them.

SCORPION FISH, TURKEYFISH, STONEFISH

Suborder COTTOIDEI

In the scorpion fish (family Scorpaenidae) (Fig. 95) the dorsal and pectoral fins of these marine fish are elongated and hollow, and can be used like the needle of a syringe to inject venom. The most ornate in appearance is the

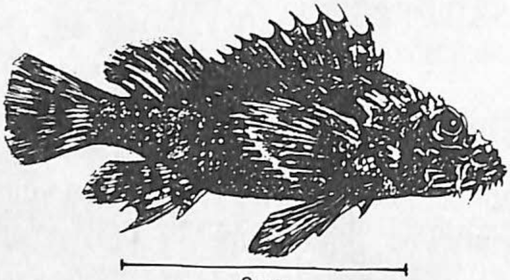

Fig. 95: Scorpion Fish
(*Scorpaenopsis rosea*)

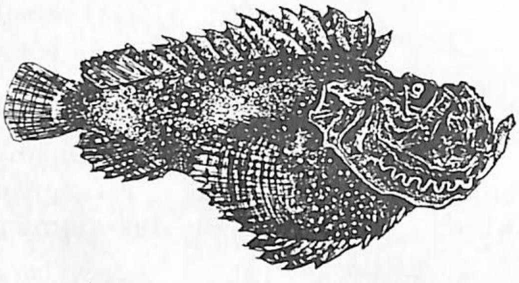

Fig. 96: Stonefish
(*Synanceia verrucosa*)

turkey fish (*Pterois*), so named from its long, feather-like pectoral fins. It is also known as lion-fish, as these fins suggest a lion's mane. While a jab from these fish is very painful and may require hospitalization, that from the stonefish (*Synanceia horrida*) (Fig. 96) can be fatal. This fish is ideally camouflaged, and has the habit of sitting motionless on the sea bottom where it looks like a stone. If accidentally trodden upon, the sharp spines of the dorsal fin can penetrate through rubber soles.

FLATFISH
Order PLEURONECTIFORMES

These marine fish are popularly known as flatfish, the body being flattened dorso-ventrally. The young start life with their eyes situated symmetrically on each side of the head. But as they grow, one of the eyes starts moving until it reaches the opposite side of the head, so that ultimately both the eyes are on one side of the skull. The fish now falls over on one side and lives at the sea bottom. The fish are described as dextral or sinistral, on the basis of whether their eyes are on the right or left side of the head. The side of the body away from the eyes is known as the blind side.

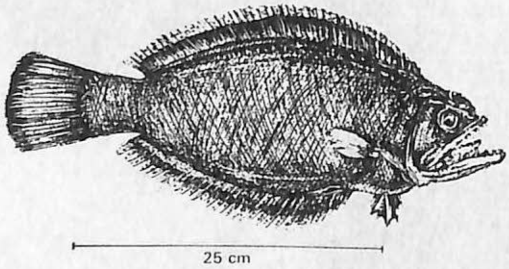

Fig. 97: Indian Halibut
(*Psettodes erumei*)

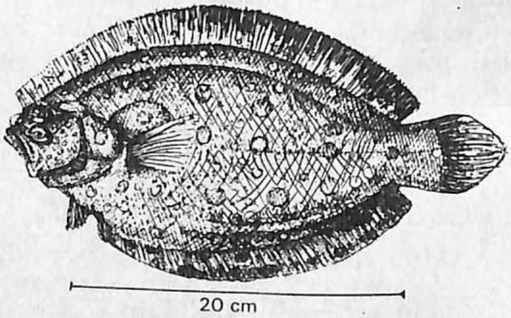

Fig. 98: Flounder
(*Pseudorhombus arsius*)

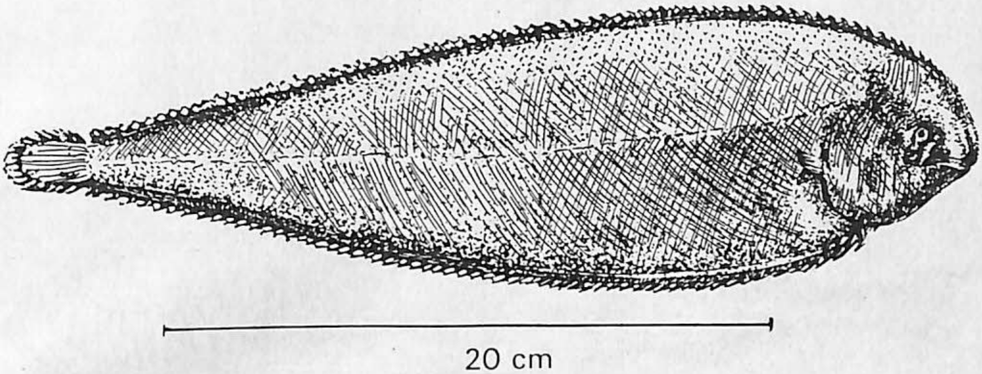

Fig. 99: Sole (*Synaptura commersoniana*)

The halibut (*Psettodes erumei*) (Fig. 97) is the most primitive of the flatfishes. The dorsal fin does not extend on the head, but starts at the nape of the neck. One of its eyes, instead of migrating to the coloured side, remains on top of the head. Their flesh is as tasty as that of pomfrets, but the gruesome appearance of the head prevents them from being popular as food.

Some plaices (e.g. *Pleuronectes*) are right-handed, while flounders (e.g. *Pseudorhombus*) (Fig. 98) are left-handed.

Soles (*Synaptura*) (Fig. 99) have their eyes on the right side; the tail is separate from the dorsal and anal fins. But in the tongue-soles (*Cynoglossus*), which have their eyes on the left side, the dorsal and anal fins are continuous with the tail.

SPINY EELS

Order MASTACEMBELIFORMES

Known as spiny eels (Fig. 100) because of their elongated bodies with a few free spines in front of the dorsal fin, there are two genera (*Mastacembelus* and *Macrognathus*) comprising medium-sized (up to 60 cm) freshwater fish. Their unusual appearance and quaint swimming behaviour makes them popular aquarium pets when young.

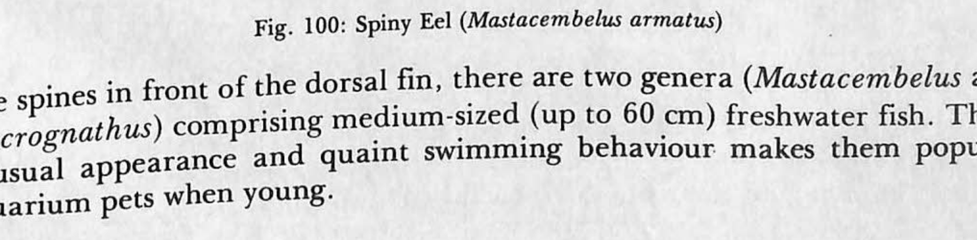

Fig. 100: Spiny Eel (*Mastacembelus armatus*)

REMORAS
Order ECHENEIFORMES

The remoras or suckerfish (*Echeneis naucrates*) (Fig. 101), marine fish, are peculiar in that the dorsal fin has shifted forward to a position over the head and become modified to form an efficient sucker. The plates inside the oval disc can be erected or flattened like the slats of a Venetian blind, and the fish can temporarily attach itself to sharks, sunfish, billfish, turtles and even whales to get a free ride. At some places fishermen use them to catch turtles. A long cord is first tied to its tail. It is then taken out in a boat and released into the sea when a turtle is sighted. It swims towards the turtle and attaches itself to it and is then, together with the turtle, hauled into the boat by drawing in the cord.

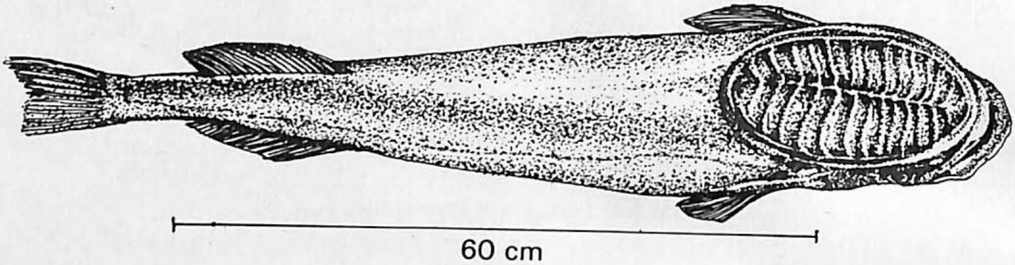

Fig. 101: Suckerfish (*Echeneis naucrates*)

TRIGGERFISH, FILE FISH, PUFFER FISH, SUNFISH
Order TETRAODONTIFORMES

Triggerfish (*Balistes*) (Fig. 102), marine fish, have a diamond-shaped body, almost half of which is occupied by the huge spade-shaped head. The pelvic fin (if present) is modified into a stubby spine. The sharp, chisel-like teeth can break off pieces of hard coral for food, and some species sleep on the sea bottom, lying on their sides. When the first dorsal fin is erected, the small

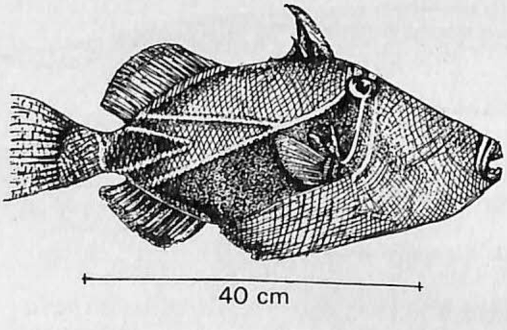

Fig. 102: Triggerfish (*Rhinecanthus rectangulus*)

second spine fits into a socket of the first spine and locks it in place. Pressure on the first spine will not lower the fin but tickling the second spine will. These spines thus function like the safety catch of a gun and give the fish its name. This device is used by the fish, when in danger, to wedge itself in a coral crevice from which it cannot be extricated.

The related leatherjacket (*Aleutera*) (Fig. 103), a marine fish, looks fragile and harmless but has the ability to catch and eat the deadly Portuguese man-of-war or bluebottle *Physalia*—a cousin of the jellyfish, whose tentacles can kill a man with their deadly venom.

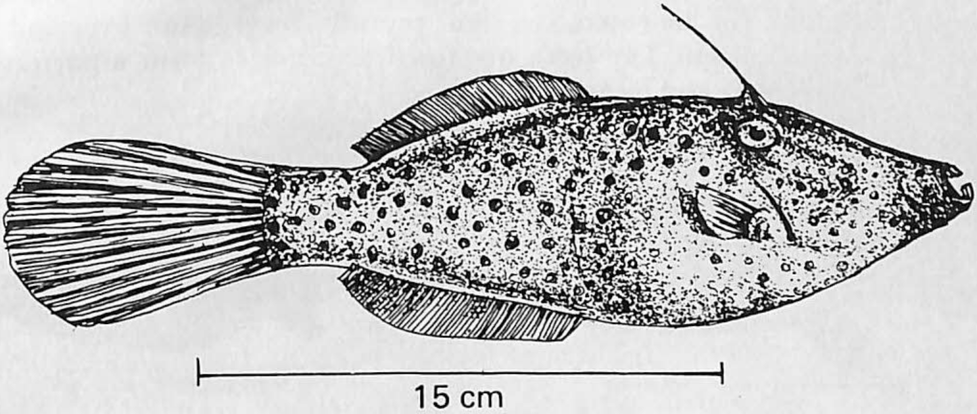

Fig. 103: Leatherjacket (*Aleutera scripta*)

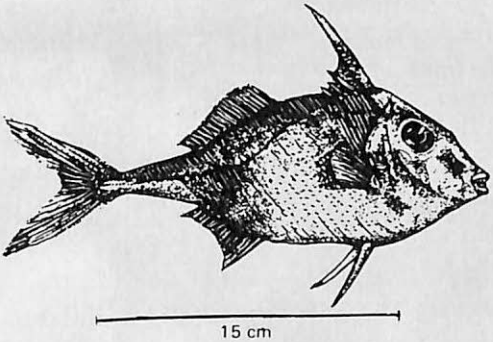

Fig. 104: File Fish or Tripodfish
(*Triacanthus brevirostris*)

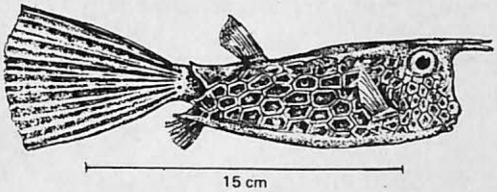

Fig. 105: Boxfish or Cow Fish
(*Ostracion cornutus*)

The tripodfish (*Triacanthus*) (Fig. 104), also a marine fish, has a compressed body with small spiny scales which give the fish its other name—file fish. The two pelvic fins are in the form of long, strong spines and these, together with the similar looking dorsal fin spine, can be locked erect to enable the fish to rest on these and the tail.

In the boxfish (*Ostracion*), a marine fish, the body is completely encased in a rigid, bony armour of hexagonal plates, with holes for the eyes, mouth, tail and fins. It swims slowly by means of paddling movements of the dorsal and tail fins. In one species called the cowfish (*Ostracion cornutus*) (Fig. 105) there are two forward-pointing spines in front of the eyes, like a cow's horns.

Puffer or globefish (*Tetrodon*) (Fig. 106) which are found both in the sea and in brackish water have a smooth, scaleless skin with small, soft prickles. There are no pelvic fins. The intestine has offshoots into which air or water can be pumped so that the fish, when alarmed, can puff itself up like a balloon. Although the flesh can be eaten, the skin, reproductive organs, liver and gut are extremely poisonous. The teeth are fused together to form a parrot-like beak, with only two plates in each jaw.

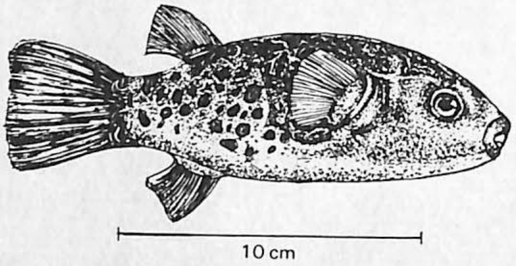

Fig. 106: Pufferfish or Globefish
(*Tetrodon fluviatilis*)

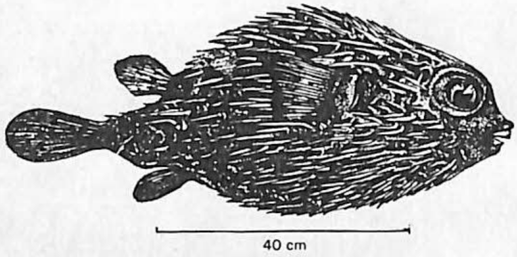

Fig. 107: Porcupine Fish
(*Diodon hystrix*)

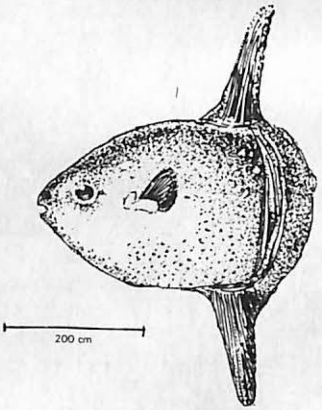

Fig. 108: Sunfish (*Mola mola*)

In the related marine porcupine fish (*Diodon*) (Fig. 107) the body is covered with stout spines which, when the fish inflates itself, stand erect. The beak is formed of only one plate in each jaw.

The ocean sunfish (*Mola mola*) (Fig. 108) looks as if it has only a head and no body, as its dorsal and anal fins are situated far towards the rear. It grows to 3m in length and is often found lying on its side on the sea surface, basking in the sun. The flesh is soft and of gelatinous consistency.

DRAGONFISH, MONKFISH

Order PEGASIFORMES

In the Dragonfish (*Pegasus*) (Fig. 109), a marine fish, the head and front part of the body are encased in a solid case of bony rings, leaving the tail region free. The tiny mouth is situated below a long, blunt snout. The pectoral fins are enlarged horizontally and resemble a dragon's wings.

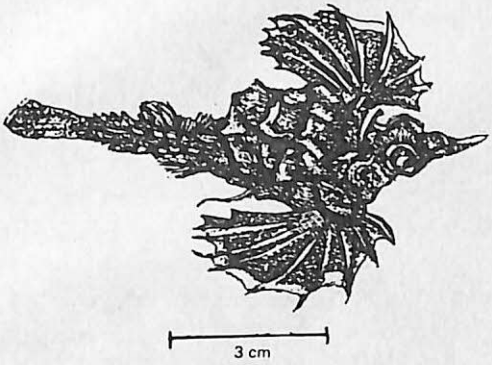

Fig. 109: Dragonfish
(*Pegasus draconis*)

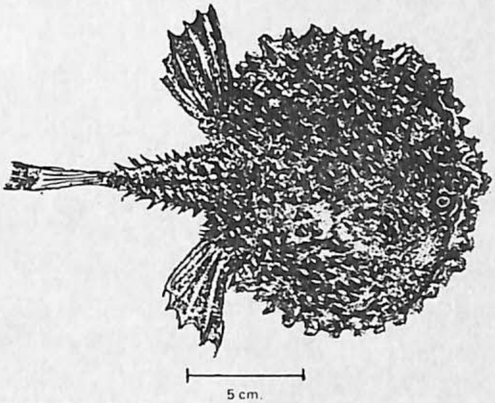

Fig. 110: Monkfish
(*Halieutea stellata*)

The monkfish or handfish (*Halieutea stellata*) (Fig. 110) is a 20 cm long, spiny marine fish with a broad, flat, hard, disc-like head and body, and a slender, tapering tail. A spine on the dorsal fin is modified to form a crude angling rod (See *Anglerfish*, below). The pectoral and pelvic fins are shaped like limbs.

ANGLERFISH

Order LOPHIIFORMES

Anglerfish (Fig. 111) are principally deep-sea fish, but a few shallow water marine representatives occur (*Antennarius*). They have a lumpy, misshapen

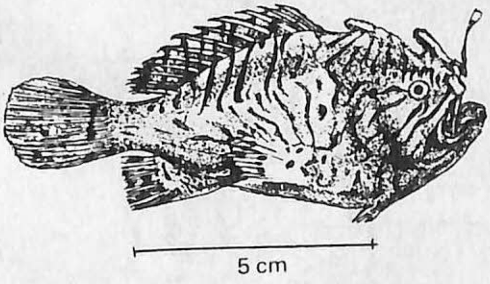

Fig. 111: Anglerfish
(*Antennarius hispidus*)

body without scales. The pectoral and pelvic fins look like stumpy limbs with the help of which the fish slowly and stealthily 'walks' to stalk its prey. The first spine of the dorsal fin is modified to form an angling rod with a brushlike, tufted tip which forms the 'bait'. When the fish is hungry, it lies almost completely buried at the sea bottom and wiggles its spine to attract the attention of an unwary fish which mistakes it for a tempting worm. While it approaches to investigate, the angler fish opens its gaping mouth and the prey is sucked in and swallowed.

USES OF FISH

When one thinks of the uses of fish, the first that comes to mind is of fish as food. Fish have been an item of man's diet from prehistoric times. Apart from their abundance both in the oceans and in fresh waters, fish are rich in proteins (from 13 to 20% of the body weight), as well as calcium, iodine and fluorine. Their use as food has nowadays become fashionable as they are rich in polyunsaturated fatty acids, which help to keep the excess of cholesterol in check and prevent subsequent blocking of blood vessels that lead to heart attacks and strokes. They may be eaten fresh, or preserved by cold storage, salting, sun-drying, smoking, pickling in brine or vinegar, and canning.

Fishes also yield valuable by-products. Sardines, herrings, mackerel, etc. are rich in oil. This fish oil can be extracted by pressing or boiling in water, and refining. Fish oils are used for preparing margarine or as a base in oil paints. Oil from the liver of sharks is rich in Vitamin A and is given as a tonic to prevent eye disorders and general debility.

Fish meal is obtained by drying or solvent extraction and grinding. Oil has to be removed to prevent rancidity, and the coarse product is used as a basic feed for livestock like cattle and poultry. High quality fish meal prepared under hygienic conditions can be treated with acids to dissolve the proteins. These are subsequently precipitated to yield a powder known as FPC (fish protein concentrate) or fish flour. This can be added to curry or bread to enrich the diet.

Like animal gelatine glue, fish glue can be obtained from fish. The best quality fish glue, obtained from the skins of flatfish dwelling on the sea bottom, is used in photo-engraving, while fish heads and bones yield a lower quality glue. The purest form of fish gelatine, isinglass, is obtained from the swim-bladders of large fishes like threadfins and croakers. It is used for making jellies and in clearing wine. Ten grams of isinglass can clear up to 265 to 400 litres of wine.

Sharkskin is used to make high quality leather for purses, belts and shoes. Pearl essence is obtained by making a suspension of the light-reflecting guanine crystals coating the scales of silvery fish. It is used to paint the insides of hollow glass beads sold as artificial pearls, and on household idols and decorative items to impart a pearly sheen.

Insulin from fish pancreas is more stable and more easily extracted than that from cattle or pigs. It is used for the control of diabetes. Fish also help in curbing diseases. Fish which feed on aquatic insects are introduced in stagnant waters, where they feed on mosquito larvae which spread malaria and yellow fever. Other fish feed on a copepod known as *Cyclops,* which is a carrier of the parasite causing guineaworm.

Since fish play such a major role as food for man, important commercial fisheries have developed, which provide a livelihood to many fishermen. These, in turn, provide employment in ancillary industries such as net making, ice factories, boat building, canning, etc.

Man does not live by bread alone. He requires relaxation and entertainment. This desire has developed into the hobby of sport fishing or angling, where the motive is primarily man's pleasure, and catching fish is only secondary. The indoor-oriented person can also have his enjoyment by just watching the beauty and behaviour of fishes, kept in glass aquaria, with which, till the advent of scuba diving, he was unfamiliar.

A CAUTIONARY NOTE

Fish, thus, provide man with food, medicines and other ingredients in daily life, employment to millions and, above all, act as balancing forces in our environment. Yet human greed threatens to destroy this harmony between man and nature (here represented by the multitude of useful and beautiful fish found in the rivers and oceans of the world).

Man has always tended to think of the oceans as boundless, and their bounty limitless, and the natural resilience of many of the ocean fish enables them to maintain their population despite ceaseless fishing over the centuries. But the depletion of a few species, particularly useful to man, in excessive numbers may not only endanger the very existence of these species—permanently depriving man of their benefits—but may endanger the web of life of which they are a link. Pollution of our inland and oceanic waters by industry, shipping and domestic waste can empty them of the very fish on whom man depends. The possibilities are endless and the stakes are high. Only a total commitment to our natural heritage, whatever its form, can prevent catastrophe. Such commitment can only grow out of knowledge and love. The great *rishi* Chyavana once took a vow to perform severe penance under water. Accordingly, he is reputed to have stayed under water for twelve years, where he befriended all the aquatic life that surrounded him. We cannot repeat his performance to acquire knowledge and love of fishes. But this book is intended to be a small step in fostering such knowledge and love.

GLOSSARY

(Terms in the explanations which have been separately defined are italicized)

Adipose fin — a *fin* made up of fatty tissue instead of the usual fin structure of *spines* and/or rays. It is behind, and separated from, the *anterior dorsal* fin.
Anadromous — fish that migrate from the sea to fresh water for breeding.
Anal fin — the vertical *fin* immediately behind the vent (anus).
Anterior — forward of; in front of; nearer the head.
Anus — vent; external opening of intestine.

Barbels — soft, thread-like filaments around the mouth, varying in number from 4 to 8, and sensitive to touch.
Benthic — animals living on or in the sea bottom.

Canine teeth — conical, pointed teeth longer than, and therefore projecting beyond, other teeth.
Catadromous — fish that migrate from fresh water to the sea for breeding.
Caudal fin — tail *fin*.
Compressed — flattened from side to side.

Depressed — flattened from top to bottom.
Dorsal — on the back; higher than.
Dorsal fin(s) — one or more vertical fins situated on the midline on the back of a fish.

Fin — a flat, plate-like structure used by the fish for swimming and steering.
Fin-ray — branched or forked, stiff structures supporting and strengthening the *fin membrane*. In primitively evolved fish, only fin-rays are present, there being no fin spines.

Gills — red, comb-like breathing organs of fish, situated on either side of the bottom of the mouth.
Gill-cover — A large, flat bone covered by skin, over the gills. Also called *opercle* or operculum.
Gill slits — narrow openings—usually five pairs—in sharks and rays, from which water is expelled while breathing.

Ichthyology — study of fishes (in Greek, *ikhthus* = fish; *logus* = account).

Lateral — at or towards the side.
Lateral line — a line formed by a row of scales having pores (holes) running horizontally along the sides of the body of a fish from behind the gill-covers up to the tail. It is a sense organ by which the fish perceives vibrations.

Median — situated on the lengthwise centre-line along the back or belly.
Membrane — a thin, flat flexible sheath.

Opercle, operculum — see *gill-cover*.
Oviducts — a pair of tubes through which the ova (eggs) pass on their way outside the body.
Oviparous — producing eggs which are laid in, and later hatch in water.

Pectoral fins — a pair of fins situated on the side of the body just behind the *gill*-covers, analogous to our arms.

Pelagic — animals living at or near the surface of water.

Pelvic fins — a pair of fins situated on the *ventral* part of the body. They may be situated halfway between the *gill*-covers and *anal* fin, or farther forward and almost below the *pectoral* fins. They are analogous to our legs. Also called *ventral* fins.

Pore — very small opening in the skin.

Posterior — backward of, behind, nearer the tail. Opposite of *anterior*.

Scales — thin, flat, semi-transparent horny plates covering the body in most fishes.

Serrated — with minute, saw-like teeth.

Scute — an external horny or bony plate.

Snout — part of head in front of mouth, usually used to indicate elongation of the mouth.

Spine (of fin) — stiff, unbranched support of fin. In *fins* supported by both spines and rays, the spines are *anterior* to the rays. A fin-spine may be simple, jointed or *serrated*.

Venom — a toxic substance that is harmful when it is injected into the bloodstream, usually injected through a sharp *spine*.

Ventral — on the belly, lower than.

Ventral fins — See *pelvic* fins.

Viviparous — giving birth to young directly from the body (instead of laying eggs).

COMMON, SCIENTIFIC AND VERNACULAR NAMES OF FISHES
(referred to in the text)

Beng. – Bengali; *Hind.* – Hindi; *Guj.* – Gujarati; *Kan.* – Kannada; *Mal.* – Malayalam; *Mar.* – Marathi; *Or.* – Oria; *Punj.* – Punjabi; *Tam.* – Tamil; *Tel.* – Telugu.

Anchovy (*Thryssa*) – Palli, *Guj.;* Monangoo, *Mal.;* Kati, *Mar.;* Pussai, *Or.;* Netholi, *Tam.;* Natoo, *Tel.*

Angel fish (*Pomacanthus*) – Lolla terate, *Mal.;* Kullu-koli-meen, *Tam.;* Jatipyna, *Tel.*

Bahmin, Indian salmon (*Eleutheronema*) – Rawas, *Guj.;* Ramsi, *Kan.;* Rawas, *Mar.;* Tobrodah, *Tam.;* Polunkala, Maga jellee, *Tel.*

Barb (*Puntius*) – Potah, *Hind.;* Gid pakke, *Kan.;* Khavalya, *Mar.;* Jundoori, *Punj.;* Pungella, *Tam.;* Kannaku, *Tel.*

Barracuda (*Sphyraena*) – Bhungar, *Guj.;* Cheelahoo, Neduva, *Mal.;* Badri, Gangya, Ghalse, *Mar.;* Jeela, Ooli, *Tam.;* Jellow, *Tel.*

Black pomfret (*Apolectus niger*) – Adadio, Halwa, *Guj.;* Kar arwoolee, *Mal.;* Halwa, *Mar.;* *Baal, Or.;* Curroopoo vovah, *Tam.;* Nala sandawah, *Tel.*

Bombay duck (*Harpodon nehereus*) – Bumaloh, *Beng.;* Bumla, Gulchi, *Guj.;* Bombil, *Mar.;* Cucah sawahri, Coco mottah, *Tel.*

Butterfish (*Trachynotus*) – Vella oodoo, *Mal.*; Ladgu, *Mar.;* Kootili, *Tam.*

Butterfly fish (*Chaetodon*) – Pardesi, *Mar.;* Munja-cooli-meen, *Tam.;* Painah, *Tel.*

Catfish (*Heteropneustes*) – Singi, *Hind.;* Kahree meen, *Mal.;* Singee, *Or.;* Nullie, *Punj.;* Shunken, Thaylee, *Tam.;* Marpu, *Tel.*

Catfish, freshwater (*Mystus*) – Kuggur, *Hind.;* Shingala, Shingti, Katia, *Mar.;* Tengara, *Punj.;* Sholang kelletey, *Tam.*

Catfish, marine (*Tachysurus*) – Khaga, Dharawa, *Guj.;* Shede, *Kan.*, Valia etta, *Mal.;* Shingala, Shingti, *Mar.;* Keleru; *Tam.*, *Jellalu,* Tel.

Catla (*Catlacatla*) – Catla, *Beng.;* Barkur, *Or.;* Botchee, *Tel.*

Cock-up (*Lates*) – Begti, *Beng.;* Gariyu, *Guj.;* Guri, *Kan.;* Nair meen, *Mal.;* Khajura, Jeetada, *Mar.;* Durruah, Bekkut; *Or.;* Koduva, *Tam.;* Pandu menu, *Tel.*

Croaker (*Johnius, Otolithes*) – Dhoma, Dhangara, *Guj.;* Palli kora, *Mal.;* Dhoma, *Mar.;* Putteriki, Birralli, *Or.;* Kathali, *Tam.;* Golaree, *Tel.*

Danio (*Danio*) – Debari, *Beng.;* Bonkuaso, *Or.;* Khan-ge, *Punj.;* Chela purroowoo, *Tam.*

Devil ray, Manta (*Mobula*) – Waraloo, *Guj.;* Karaj, Shing pakat, *Mar.;* Kombu thirukai, *Tam.;* Eergoodoo tenkee, *Tel.*

Dogfish, Catshark (*Stegostoma*) – Musia, *Guj.;* Shinavale, *Mar.;* Corungun schura, *Tam.;* Urukoolti sorrah, *Tel.*

Dolphinfish (*Coryphaena hippurus*) – Himra machchhi, *Guj.;* Himra masa, *Mar.;* Badahlan, *Tam.*

Eagle ray (*Aetobatis*) – Wagaliu, *Guj.;* Wagha, *Kan.;* Bolad, Wagli, *Mar.;* Kurivi thirukai, *Tam.;* Eel tenkee, *Tel.*

Eel (*Anguilla*) – Hari meenu, *Kan.;* gnalu, *Mal.;* ahir, *Mar.;* Serem pambu, *Tam.;* Malungulu, *Tel.*

Electric ray (*Narcine, Torpedo*) – Zinzina, *Mar.;* Thimili *Tam.:* Timiri tiki, *Tel.*

File fish (*Triacanthus*) – Bail masa, *Mar.;* Satoorah, *Or.;* Mullu klathi, *Tam.;* Abatoo, *Tel.*

Flounder (*Pseudorhombus*) – Jipti, *Guj.;* Lepti, Lep, Jibhtee, *Mar.;* Patney sootong, *Tam.;* Nooru nalaka, *Tel.*

Flyish fish (*Exocoetus, Cypselurus*) – Jira, *Guj.;* Kathala, *Mar.;* Parraway kolah, *Tam.*

Freshwater shark (*Wallago*) – Bogari, *Beng.*; Padin, *Guj.;* Wahlah, *Mal.;* Shivda, Pahadi, *Mar.;* Wahlah, *Tam.*

Gar (*Tylosurus*) – Kagada, Kunga, *Guj.;* Coplah, *Mal.;* Toli, *Mar.;* Sona, *Punj.;* Coco meen, Pumbu mural, *Tam.;* Kuddera, *Tel.*

Glass fish (*Chanda*) – Chandee, *Beng.;* Mullu jubbu, *Kan.;* Mullu cheru, *Mal,;* Gaude chiri, *Mar.;* Goa chappi, *Or.;* Mucknee, *Punj.;* Akkurati, *Tel.*

Goatfish (*Upeneus*) – Chiri, *Guj.;* Cheerul, *Mal.;* Chiri, Raja, *Mar.;* Kal nakharai, *Tam.;* Rahtey goolivinda, *Tel.*

Goby (*Awaous, Glossogobius*) – Levta, *Guj.*; Ab-bro-my, *Kan.;* Pooan, Kurdan, *Mal.;* Kharbi, *Mar.;* Gulah, *Or.;* Gooloowah, *Punj.;* Nullatan, Uluvai, *Tam.;* Tsikideondoa, *Tel.*

Golden anchovy (*Coilia*) – Mandeli, *Guj.;* Mandeli, *Mar.;* Oorialli, *Or.*

Grouper, Rock cod (*Epinephalus*) – Wekhali, *Guj.;* Kurrupu, *Mal.;* Hekru, Gobra, *Mar.;* Komari kaleva, *Tam.;* Bontoo, *Tel.*

Half-beak (*Rhynchorhamphus*) – Kagada, Kunga, *Guj.;* Toli, Sumb, *Mar.;* Gongaturi, *Or.*

Hammerhead shark (*Sphyrna*) – Raan moosi, *Guj.;* Variocha, *Kan.;* Kanar, *Mar.;* Komben schuri, *Tam.;* Sappa sorrah, *Tel.*

Jewfish (*Protonibea*) – Poa, *Beng.;* Ghol, *Guj.*, Gholi, Balde, *Kan.;* Kora, *Mal.; Ghol, Mar.;* Kathali, *Tam.;* Gorasalu, *Tel.*

Killiefish, Top minnow (*Aplocheilus*) – Pangchax, *Beng.;* Kanakuri, *Or.*

Kingfish (*Rachycentron*) – Modasa, *Guj.;* Sakla, Muddus, *Mar.;* Kedal viral, *Tam.*

Loach (*Botia*) – Bucktea, *Hind.;* Sahinga, *Punj.*

Mackerel (*Rastrelliger*) – Aylla, *Mal.;* Bangda, *Mar.;* Karankita, *Or.;* Ailai, *Tam.;* Kanagurta, *Tel.*

Magur (*Clarias*) – Magur, *Beng.;* Magurah, *Or.;* Kugga, *Punj.;* Marpoo, *Tel.*

Mahseer (*Tor*) – Kudna, *Guj.;* Khadra, Mahseer, *Mar.;* Pu meen, *Tam.*

Milkfish (*Chanos*) – Hu meen, *Kan.;* Pal meen, *Tam.;* Palah bontah, *Tel.*

Moray (*Gymnothorax, Muraena*) – Kalas, Naro, *Guj.;* Kilis, Hesal, *Mar,;* Aajalai, *Tam.;* Chuka pam, *Tel.*

Mudskipper (*Periophthalmus*) – Levta, *Guj.;* Nivti, *Mar.;* Thetthi koruvai, *Tam.*

Mullet (*Mugil*) – Tarui, Bangon, *Beng.;* Boi, Bhomat, Gandhio, Mangan, *Guj.;* Undala, Hind.; Boi, Pilsa, Mangin, Bhadvi, *Mar.;* Kakunda, *Or.;* Buah, *Punj.;* Manalei, *Tam.*

Oil sardine (*Sardinella*) – Tarli, *Guj.;* Boige, Bhutai, *Kan.;* Matthi Noone, *Mal.;* Tarli, Haid, Kanat, *Mar.;* Pesalai, *Tam.;* Kowalu, *Tel.*

Parrotfish (*Callyodon*) – Kullaray meen, *Mal.;* Chikoti, *Mar.*

Pearl Spot (*Etroplus*) – Pitul kas, *Hind.;* Pullatay, *Mal.;* Kalunder, *Mar.;* Cundalah, *Or.;* Pillinchan, Boorakas, *Tam.*

Pennant fish (*Heniochus*) – Purroamee, *Mal.;* Chuddukan, *Tam.*

Pike conger (*Congresox*) – Wam, *Guj.;* pamboo, *Mal.;* Wam, *Mar.;* Velangu, *Tam.;* Talabon, *Tel.*

Pipefish (*Syngnathus*) – Vala, *Mar.;* Cul pamboo, *Tam.;* Goorahpoo subbookoo, *Tel.*

Puffer fish (*Tetrodon*) – Paatha, *Mal.;* Kend, *Mar.;* Bheng pulli, *Or.;* Pulli peytthai, *Tam.*

Rabbitfish (*Siganus*) – Kut-e-rah, *Mal.;* Thaoos, *Mar.;* Worahwah, *Tel.*

Razorfish (*Notopterus*) – Pholoe, *Beng.;* Patre, *Guj.;* Chalat, *Mar.;* Pulli, *Or.;* Moh, But, *Punj.;* Chotah wahlah, *Tam.*

Remora (*Echeneis*) – Lachuk, Nachuk, *Mar.;* Ubbay, *Tam.*

Ribbonfish (*Trichiurus*) – Baga, Patti, *Guj.;* Pambadu, *Mal.;* Wagti, Baga, *Mar.;* Baale, *Kan.;* Puttiah, *Or.;* Savalai, *Tam.;* Sawala, *Tel.*

Rock catfish (*Plotosus*) – Moorghee, *Mal.;* Naar shingala, *Mar.;* Trung keleru, *Tam.*

Sable fish (*Hilsa*) – Hilsa, *Beng.;* Chaski, Chaksi, Modar, *Guj.;* Bhing, Pala, *Mar.;* Ilisha, *Or.;* Ullam, *Tam.;* Palasah, *Tel.*

Sailfin (*Istiophorus*) – Kunga, *Guj.;* Tadmasa, *Mar.;* Myl-meen, *Tam.*

Sardine (*Kowala*) – Pedvi, *Guj.;* Hesdi, Berza, *Kan.;* Valoori, *Mal.;* Bhiljee, Pedwa, *Mar.;* Vellai schudai, *Tam.*

Sawfish (*Pristis*) – Churrio, Veher, *Guj.;* Naali, Win, *Mar.;* Kundah, *Or.;* Vela schura, *Tam.;* Yahla, *Tel.*

Scavenger (*Nemacheilus*) – Khorika, *Beng.;* Mura, *Mar.;* Soondali, *Punj.;* Gul irum, *Tam.*

Scat (*Scatophagus*) – Kaski, *Guj.;* Nutchar char, *Mal.;* Vada, *Mar.;* Ilethi, Sipili, *Tam.;* Chitsilloo, Eesputti, *Tel.*

Seerfish (*Scomberomorus*) – Birjram, *Beng.;* Chapri, *Guj.;* Anjal, Esvan, *Kan.;* Chumbum, *Mal.;* Soormai, Toowar, *Mar.;* Seela, *Tam.;* Vanjaramu, *Tel.*

Sergeant major (*Abudefduf*) – Calamoia pota, *Tel.*

Shad (*Ilisha*) – Phansti, Paturdo, *Guj.;* Katati, Kati, *Mar.;* Puvali, *Tam.*

Shark (*Carcharias*) – Moosi, *Guj.;* Tamsi, Khaksi, *Kan.;* Parl sorrah, *Mal.;* Mori, Mooshi, Khaada, Balda, *Mar.;* Mundah magur, *Or.;* Puducan, *Tam.;* Pala sorrah, *Tel.*

Shovel-nosed ray (*Rhynchobatus, Rhinobatis*) – Bhuther, *Guj.;* Ranja, Lanj, *Mar.;* Pal uluval, *Tam.;* Tipi ulavi, *Tel.*

Silver pomfret (*Pampus argenteus*) – Vichuda, *Guj.;* Saaranga, Paaplet, *Mar.;* Vella vavel, *Tam.;* Tella Sanduwah, *Tel.*

Snakehead, Murrel (*Chana*) – Chena, *Beng.;* Dheri dhok, *Hind.;* Hoovina murl, *Kan.;* Karavu, Curavu, *Mal.;* Daaku, *Mar.;* Sola, Chenga, *Or.;* Kubrah, Doarrah, *Punj.;* Pu verari, Korruvai, *Tam.;* Pula chapa, Kunnesee, *Tel.*

Snapper (*Lutianus*) – Kukurji, *Beng.;* Ratado, *Guj.;* Kemmasu, *Kan.;* Chembolay, *Mal.;* Taamb, *Mar.;* Soosta, *Or.;* Adallu, *Tam.;* Rangoo, *Tel.*

Sole, tongue sole (*Synaptura, Cynoglossus*) – Jipti, *Guj.;* Sappatee, *Mal.;* Lepti, Lep, Jibhtee, *Mar.;* Athal, *Tam.;* Jerree potoo, *Tel.*

Spiny eel (*Rhynchobdella, Mastacembelus*) – Gonti, *Beng.;* *Baam, Mar.;* Bara, Thuri, Bummi, *Or.;* Bahm, *Punj.;* Aral, Kul aral, *Tam.;* Bommiday, *Tel.*

Spotted dory (*Drepane*) – Pundthee, *Mal.;* Chaand, *Mar.;* Pulli, Torriti, *Tam.;* Thetti, *Tel.*

Sprat (*Dussumieria*) – Kolu Baige, *Kan.;* Kolachi, *Mal.;* Thondan, *Tam.;* Morava, *Tel.*

Squirrelfish (*Holocentrum*) – Chirya, *Mar.;* Chenguli, *Tam.*

Sting ray (*Dasyatis*) – Warkhol, Tarabla, Boor, *Guj.;* Paakat, *Mar.;* Sankush, *Or.;* Manal thirukai, *Tam.;* Puli tenke, *Tel.*

Surgeon fish (*Acanthurus*) – Soorya, *Mar.;* Kohli meen, *Tam.;* Mootah, *Tel.*

Swordfish (*Xiphias*) – Kunga, *Guj.;* Taadmasa, *Mar.;* Yemungolah, *Tam.*

Target perch (*Therapon*) – Boorgooni, *Beng.;* Naida, Garangeta, *Guj.;* Naavhera, Hajaam, *Mar.;* Gahnu, *Or.;* Palin keetchan, *Tam.;* Keelputa, *Tel.*

Tarpon (*Megalops*) – Gunnay, *Mal.;* Vadas, *Mar.;* Punnikowu, *Or.;* Marua, *Tam.;* Kundinga, *Tel.*

Threadfin (*Polydactylus*) – Daara, *Guj.;* Yeta, *Mal.;* Dada, Daara, *Mar.;* Tahlun kala, *Tam.;* Maga booshee, *Tel.*

Trigger fish (*Balistes*) – Vari klathi, *Tam.;* Rahtee yellahkah, *Tel.*

Turbot (*Psettodes*) – Hario, Dataro, *Guj.;* Bhaakas, *Mar.;* Noree nalaka, *Tel.*

Tuna (also albacore, bonito, frigate mackerel, skipjack) – (*Auxis, Euthynnus, Katsuwonus, Kishinoella, Sarda*) – Gethal, *Kan.;* Choorai, *Mal.;* Kuppa, Gedar, *Mar.;* Elichoori, *Tam.*

Unicorn cod (*Bregmaceros*) – Chirii, *Guj.;* Netali, Tenali, *Mar.;* Misalu magu, *Tel.*

White bait, Sprat (*Stolephorus, Dussumieria*) – Phansti, *Guj.;* Katati, *Mar.;* Tondai, *Tam.*

White pomfret (*Pampus chinensis*) – Pathu, Kafri, *Guj.;* Vella arwoolee, *Mal.;* Kelwad, Kafri Saarga, *Mar.;* Karappu vavel, *Tam.;* Chanduva, *Tel.*

FURTHER READING

Popular:

The Fishes, Url Lanham, Columbia University Press, New York, London, 116 pages.

A History of Fishes, J.R. Norman. Ernest Benn Ltd., London, 463 pages.

The Fishes, F.D. Ommanney, Time-Life International; Life Nature Library, Netherlands, N.V., 192 pages.

Fishes – their way of life, Louis Roule. George Routledge & Sons Ltd., Broadway House, 68-74 Carter Lane, E.C., London, 312 pages.

The Ways of Fishes, Leonard P. Schultz, with Edith M. Stern.D. Van Nostrand Co., Inc. Toronto, New York, London, 164 pages.

Technical:

The Fishes of India. Francis Day. William Dawson and Sons Ltd., London, 778 pages (Volume 1); 198 plates (Volume 2).

An Introduction to the Study of Fishes, Albert C.L.G. Gunther Adam and Charles Black, Edinburgh, 720 pages.

The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka – a handbook, K.C. Jayaram, Calcutta, 475 pages.

The Biology of Fishes, Harry M. Kyle. Sidgwick & Jackson, Ltd., London, 396 pages.

More than seventy per cent of our 'Earth's' surface is covered by water yet most of us know so little about the thousands of varieties of fish (from the tiniest which is 10 mm in length and weighs 1.5 gm to those of 20 metres in length weighing 4000 kg) that live in our rivers, seas and oceans, and the fascinating lives they lead.

This book, the second in the WWF/OUP *Nature Guides* series, captures some of the beauty and fascination of fish by describing 137 varieties commonly found in Indian rivers, lakes and the surrounding seas, illustrated by 114 black and white, line and dot, and 20 full-colour drawings. In its pages we encounter fish that live inside the body cavities of other animals, fish that can produce electricity, fish that are cannibals before they are born, male fish that give birth to the young, fish that act as dentists and doctors . . .

The common and scientific names of fishes are given in each case and there is a section on the 'Uses of Fish'. At the end of the book there is a list of the various vernacular equivalents of the names of fish used all over India for the fish described, a glossary of scientific terms used and suggestions for further reading.

Intended for children in the 12+ age group, the book will also be useful to teachers and parents

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